AFV G2

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A MAGAZINE FOR MILITARY VEHICLE ENTHUSIASTS

Volume 5 Number 6

Muzzle Blast

LETTERS • COMMENTS • NOTES • CORRECTIONS • ADDITIONS

Some Notes on Chieftans....

Dear Editor:

I recently received a letter, the contents of which might interest you and your readers. One of my pen-pal friends is a soldier in the British 17th/21st Lancers in Germany. His unit is equipped with Chieftans, and when I asked him questions about this tank, he became quite defensive about my questions on the sub-caliber ranging gun above the 120mm. This is what he said... *'the ranging gun is good up to 2000 meters, and the killing range [of the 120mm] is good up to 3000 meters. The probability of a first-round hit with A.P.* (Armor-Piercing - Ed.) *is 98% up to 3000 meters. The sight has a ballistic pattern fitted and when the ranging gun can no longer get out to the target, you just aim with the reticle dot and fire A.P. The high velocity of the A.P.D.S. [3690 feet-per-second] permits a 'see them - hit them' situation.*

This pen-pal also states that the next war will be fought in Germany and the terrain situation makes combat range a maximum of 1000 meters (700-1000 battle range according to NATO). He states that the main thing wrong with the Chieftan is its weight and its engine. The ranging gun of the Chieftans is being changed in favor of a laser range finder, permitting silent and accurate ranging over longer ranges.

I hope the above information is of interest...

Sincerely,

Paul Studley
Graham, TX

and More Comments on that Mysterious French AFV in Vol. 5, No. 2...

Gentlemen:

I think that you have a misidentification in the April-May issue of *AFV-G2*, referring to the picture of the French vehicles in the January 1975 issue.

On page 114 of *'Taschenbuch der Panzer, 1943-57'*, the same vehicle which Mr. Sears identified as a *'VP-90'* is shown. This seems to be a silhouetted enlargement from the same photograph reproduced in your January issue, and is identified (my translation from German) as a Hotchkiss weapons carrier with a 7.5cm recoilless rifle. The basic chassis is that of the Hotchkiss *TT-6*, which I don't think ever went into French service, but was used by the German *Bundeswehr* in a variety of roles: observation, reconnaissance, commuinications, light mortar vehicle and armored ambulance. At a guess, the particular vehicle in question was probably a 'one-off' prototype.

I also question Mr. Sears' identification of the two vehicles in the background. They are both tracked, so I am sure that the right-hand one is not an *EBR-75*. My guess would be that both vehicles are early (turretless) models of the *AMX-VTP* armored personnel carrier, but this is only a guess.

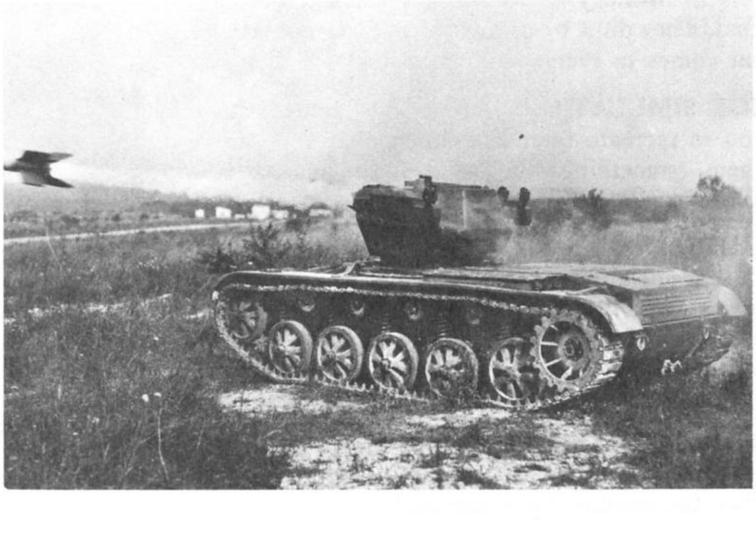
The *VP-90* prototype, sans weapon, can be seen in the French Armor Museum at Saumur, where I was in June. Saumur is by no means as complete a museum as the RAC Museum at Bovington Camp, even in so far as French vehicles are concerned, and since Saumur is 300 kilometers from Paris, it is a pretty healthy sidetrip. I was hoping to find some of the more obscure French tanks there, such as the *AMX 44* and *AMX 50*, but was disappointed. However, since we were in the Loire area anyhow, I enjoyed my visit there. For some reason, they have about twenty assorted German AFV's, in yellow paint, scattered around the parking area. I parked between a *Pz.Kpfw.IV.* and a *Panther*. In the workshop, they had a *Tiger II.B*, painted in French olive green, which they seemed to be rebuilding for some purpose unascertainable by me with my poor French.

Very truly yours,

Edward G. Weinstein
Scarsdale, NY

I'm not so sure I go along with Mr. Weinstein's or the Heigl 'Taschenbuch' *identification. A careful examination of the original photo in Vol. 5 No. 2 shows* five *road wheels on the vehicle; the Hotchkiss* TT-6 *had only* four *road wheels [according to Col. Ick's* 'Encyclopedia of Tanks'*]. While I do believe the vehicle was a prototype, I'd surmize that it is instead based on the* 'ELC' *chassis. The photo below shows this chassis mounting a Nord SS-11 missile turret.*

Dave Haugh



...a Request for Photos...

Dear Sirs:

Could you possibly help me in finding photographs or drawings of the Bren gun mount in the Daimler Scout Car as portrayed by Tamiya.

Thank you,

Kelly W. Dellinger
Bryan, TX

Can any reader provide photos or drawings as requested above for inclusion in our 'Armor in Pictures' *articles?*

G2 AFV
Volume 5, Number 6
September-October 1975

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Cover:

Our cover photo was taken on August 19th, 1944 in the vicinity of Lorenzana, Italy, and it shows one of the first 76mm gun M4A3 Shermans to arrive in Italy. The vehicle was assigned to Company 'A' of the 13th Armored Regiment, one of the component regiments of the 1st Armored Division. The outline-style number on the turret apparently identified the platoon of the company to which the tank was assigned. Note the white star on the engine deck and the missing rear sand skirt section.
Photo Credit: U.S. Army

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AFV-G2 is a magazine, published monthly for Military Vehicle enthusiasts, with the purpose of gathering and dissemnating information about Military Vehicles and their employment; to provide an opportunity for persons seriously interested in the history of Military Vehicles, in the modeling of these vehicles and associated equipment, and in the playing of Military Wargames utilizing miniature vehicles, to share ideas and items of mutual interest and to promote an interest and awareness in the subject of Military Vehicles.

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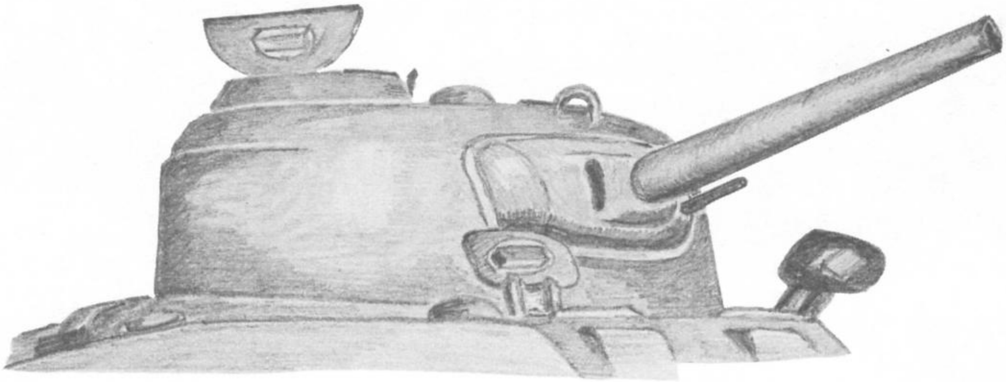

Techniques of Indirect Fire by Tanks

during World War 2

by Mark Diehl

By Spring of 1943, the battle experience of US forces had shown that indirect fire was extremely common with medium tanks. Anti-tank guns could often be attacked at ranges of 3,000 to 4,000 yards, sometimes even higher, with the tanks defiladed from enemy view. Indirect fire, or more properly, indirect gun laying occurs whenever the gunner cannot see the target. Tanks and tank destroyers could be used in either of two methods for the conduct of indirect artillery fires: as a roving battery or as an auxilliary battery. In both methods the fire unit typically was the platoon which corresponded to the field artillery battery. We shall examine each of these methods in detail.

THE ROVING BATTERY

By the direction of higher headquarters, the platoon could be employed as a roving battery of field artillery. When so employed, the platoon was placed in defiladed forward positions. It engaged targets by simple indirect fire methods and frequently moved via covered routes to previously selected alternate positions to avoid counter-battery fire. In this method, missions usually were harassing fires and the engagement of targets of opportunity. Within the limits of general instructions from higher headquarters, the platoon commander engaged with fire all enemy targets observed and displaced to alternate positions as the situation required.

A platoon commander might establish a base of fire with part of his platoon while the remainder outflanked the target. As shown in Figure 1, for example, a roadblock position of anti-tank guns and infantry may be successfully assaulted by the tank platoon and an armored infantry platoon. The tank platoon commander calls in fire from his and perhaps another tank while the remainder maneuver.

Similarly, a company commander might establish a base of fire with one platoon while the rest of his company maneuver to attack the objective. In the situation illustrated in Figure 2, one platoon of tanks provides the supporting fires for the remaining tank platoons and the armored infantry in an assault on a fortified town.

Optimum employment of the roving battery required fire from a defiladed position. The purpose of placing a tank in a defilade and firing by indirect laying was to enable it to destroy targets without exposing itself to enemy fire. With one tank in defilade, the tank commander placed himself where he could observe the target. Communication between the tank commander and the gunner was normally by voice. Where two or more tanks were placed in a defiladed position each tank commander lined in his tank and the target.

Usually, where there were more than two tanks, an observer (the platoon commander or the platoon sergeant) laid them in parallel. This one observer always adjusted the fire of all tanks. Communication was by voice relay or radio. Secrecy was important in the occupation of the position because of the close proximity to the enemy. Although the time in each position did not ordinarily require or permit a complete organization of the position, it was recommended that every advantage should be taken of cover, concealment and camouflage.

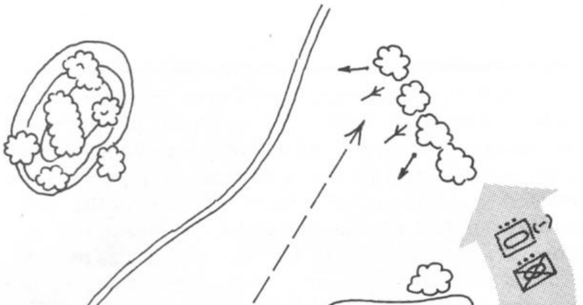

Figure 1: Use of indirect fire in support of a platoon assault.

When placing tanks or tank destroyers in a defiladed position, the first problem was to ensure that the fires would clear the crest ...... the minimum elevation for firing. The gunner elevated the gun until the line of sight along the bottom of the bore cleared the crest or mask. He then measured this elevation and added the elevation corresponding to the range-to-crest plus 4 mils for error. This sum was the minimum elevation. If tanks or tank destroyers were placed too close to a mask of trees or on a reverse slope behind a crest the range corresponding to the minimum elevation could be so great as to prohibit hitting the target. In such cases it was recommended that the vehicle be moved back and take advantage of a forward slope, as shown in Figure 3. Using the firing table for the appropriate ammunition, the minimum elevation was converted into range. This range was the shortest at which the gun could be fired from that position. As soon as each tank was placed in position, the minimum elevation and range were determined and relayed to the unit observer.

Conduct of fire for the platoon was the responsibility of the platoon commander. The platoon commander himself or a selected noncommissioned officer occupied a forward observation post, observed and conducted fire by forward observation methods. Radio communication or voice relay was used between the observation post and the firing vehicles. Sensings from the forward observer were converted to fire commands at the guns. Thus fire could be quickly be brought to bear on targets of opportunity. To facilitate adjusting fire vehicles were numbered from the right flank. The tank on the right, facind in the direction of fire, was always designated no. 1 when using indirect laying, regardless of its permanent number in the platoon.

For indirect fire missions, organic ammunition loads of the platoon remained intact: ammunition was usually supplied by the headquarters ordering the missions. The platoon ammunition vehicle, augmented by vehicles from the company, battalion or security sections, was used to assist in ammunition supply. This supply was normally carried out at night because of the location of the positions.

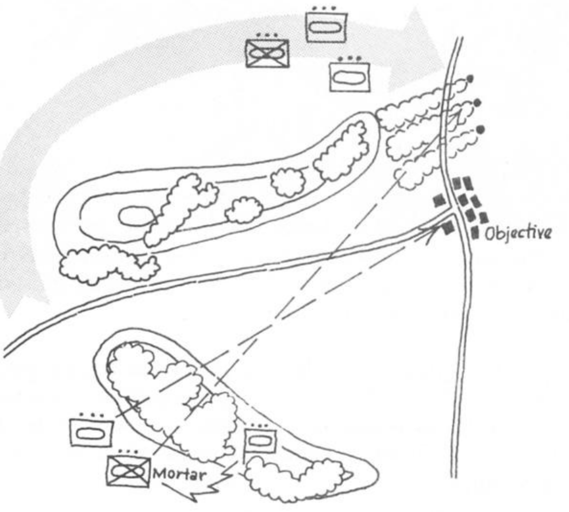

Figure 2: Indirect fire base for a company assault. Company mortars are used to lay smoke in the final stage of the assault to conceal the approach-to-contact of the flanking force. (Smoke projectiles for US tanks were only under development early in 1943, but, 81-mm mortars had an effective smoke round.)

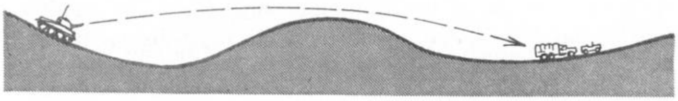

Figure 3: If tanks on a reverse slope behind a crest were not able to hit their target, they went farther back to get on a forward slope.

THE AUXILLIARY ARTILLERY BATTERY

The most advanced type of indirect laying occured when tanks were used as auxilliary field artillery. Tanks and tank destroyers acting as field artillery performed a role traditionally filled by reinforcing artillery: scheduled and prearranged fires. Examples of such fires are forcing a river crossing, passage of defiles, passages of defended minefields and like operations. In such fires, one or more companies were emplaced and their fires massed on the target. The division artillery command selected the positions, completed the survey, and prepared data for each firing platoon so employed ...... the tank and tank destroyer platoons were considered equivalent to a battery of 75-mm artillery. The mission of the platoon was to deliver effective fire on the prescribed targets.

The general location of each platoon position was determined by the company commander. The platoon commander was assigned targets and informed of the minimum ranges to be used. Firing data was furnished the platoon commander by the company headquarters. Wire communication between platoon and company was normally used when executing firing missions. The extra ammunition required was supplied to the firing position by truck: the ammunition load organic to the tank or tank destroyer platoon was left intact for use in later stages of the operation. The battalion ammunition train, having dumped its organic load in the position area, usually provided the ammunition for extended indirect fire missions.

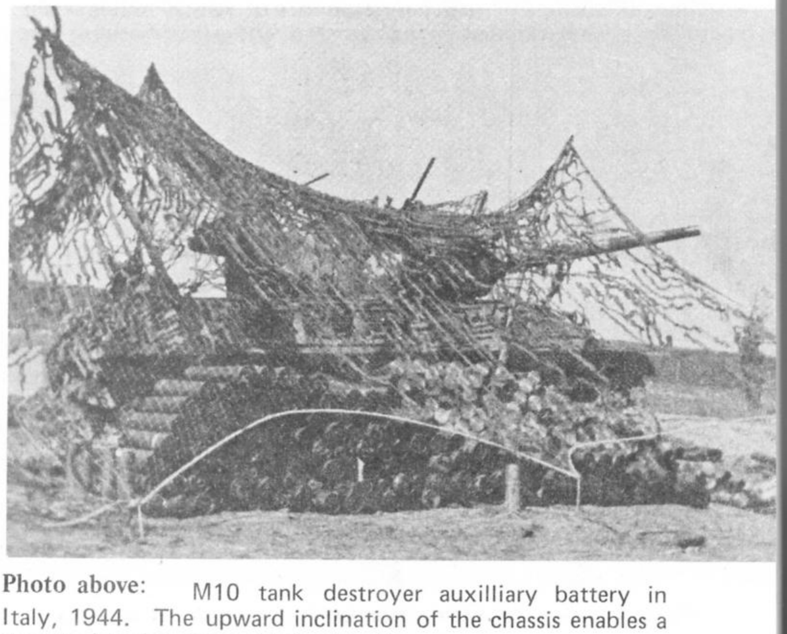

Photo above: M10 tank destroyer auxilliary battery in Italy, 1944. The upward inclination of the chassis enables a greater elevation to be obtained on the gun.

Indirect fire positions were occupied as ordered by higher authority. In the reconnaissance and selection of a position, many elements were taken into consideration. Guns were located to fire at the minimum range which the mission required and still be within range of the most distant target. Routes into and out of the position followed existing trails as the creation of new paths or trails was likely to disclose the position. Additionally, the routes selected were sufficient for transporting supplies to the position and enabling the platoon to move out quickly without interfering with other units, should its mission be changed. Alternate positions were selected as an escape from hostile counter battery fires. Supplementary direct fire positions were also selected for occupation in the event of an enemy tank attack. Since the tanks and tank destroyers usually were dug in, hard soils with difficult digging were hopefully avoided. The position selected was also designed to provide some degree of cover and concealment against enemy direct fire and observation of muzzle flashes. If the entire assigned area was in the open, a position in which artificial camouflage blended in well with the surroundings was selected and prominent terrain features which might have become enemy artillery registration points were avoided.

Occupation of the position usually took place during darkness and a guide was provided to lead each tank or tank destroyer to its position. The guns were laid ready to fire, positions camouflaged and firing pits dug before daylight. Air warning sentinels were posted and measures were taken to conceal all evidence of position occupation. The vehicles were dispersed to reduce losses from enemy artillery and air attack. Dispersion in depth provided better all around defense in case of a tank attack. Auxilliary vehicles were parked out of jeopardy from any enemy fire placed on the position.

Normal dispersion of the platoon required special measures for effective control by the platoon commander. This was mostly a matter of individual enginuity if no communication system was provided between the platoon commander and the guns. Common measures used were megaphones, sound-powered or battery telephones on a party line, extensions of vehicle interphones or vehicle radios when silence was not ordered and when open frequencies and channels existed.

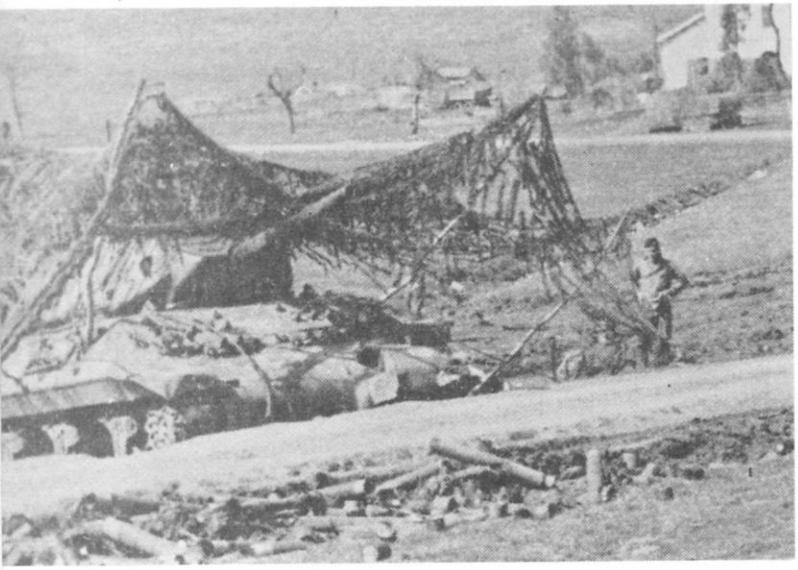

Photo above: Continuation of the position in the previous photo. Note the dispersion of the vehicles and the stake on the end of the "staked line" in front of the position.

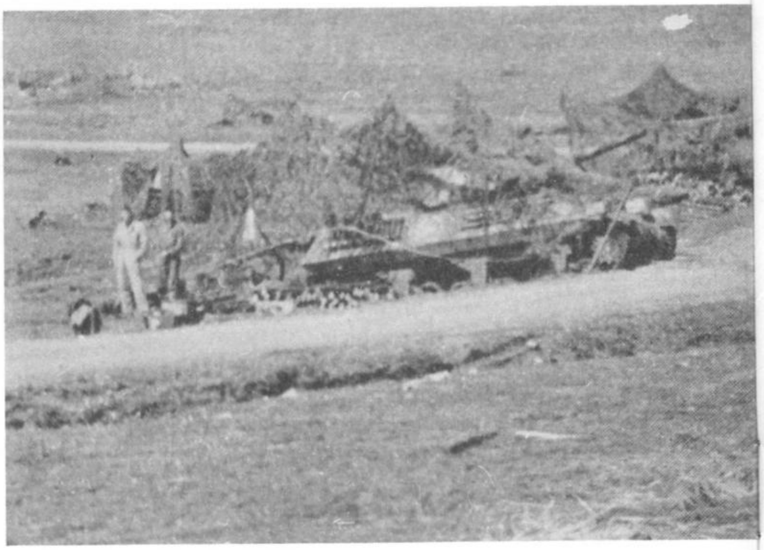

Photo above: Continuation of the position in the previous photos. Vehicles remained camouflaged during fires; note the extent of extra ammunition supplied to the vehicle.

The platoon leader was responsible for the fires of his platoon. To obtain accurate prearranged fires, the artillery provided a target area survey. The field artillery executed fire direction by designating targets, time of firing and the number of rounds to be fired. Data for these fires were computed by company headquarters and transmitted to the platoons, often in the form of a prearranged data card. Occasionally the platoon delivered observed fires based on data received from the artillery, or on sensings received from forward observers. The platoon commander was sometimes ordered to use his platoon for the delivery of indirect fire against targets of opportunity, thus adjusting and conducting fire from an observation post. He then provided his own observer and his own executive at the gun positions, himself or a qualified noncommissioned officer, and his own radio communications.

VEHICLE INSTRUMENTS FOR INDIRECT FIRES

Several indirect fire instruments were mounted on all M4 tanks and M10 tank destroyers. These instruments were the gunner's quadrant, a graduated elevating handwheel, and an azimuth indicator. Additionally, each platoon was issued two panoramic machinegun sights.

The gunner's quadrant enabled the vehicle gun to be accurately laid for elevation. Its principal components are a bubble level and a mil scale. Figure 4 is a drawing of this quadrant, and figure 5 shows its position on the breech of the tank gun.

Used in conjunction with the quadrant is the graduated elevating handwheel. Each gradation on the wheel represents a one mil change in gun elevation. A total of 25 gradations are present on the wheel, yielding 25 mils per revolution. The handwheel found in the M4 Sherman tank is shown in figure 6.

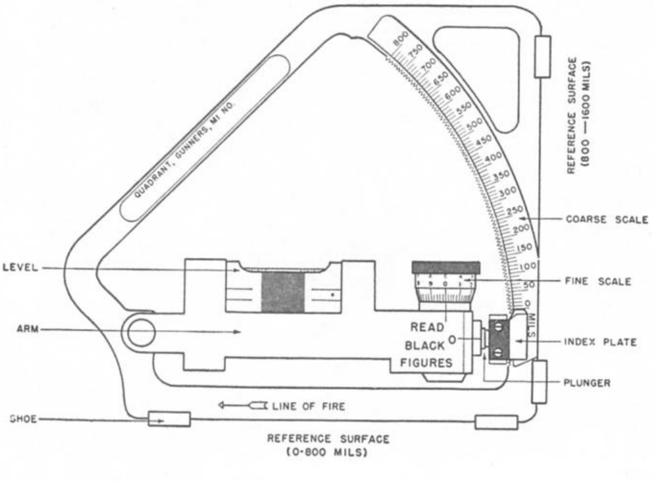

Figure 4: The gunner's quadrant.

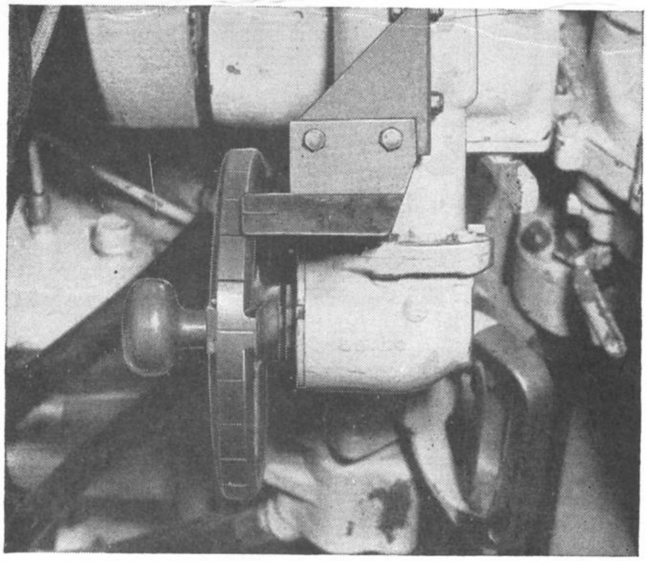

FIGURE 37.—Graduated elevating handwheel, medium tank M4.

Figure 6: The graduated elevating handwheel in the Sherman.

The azimuth indicator found in the Sherman tank is a dialed instrument having a dual pointer system. Mil deviation of the turret from the long axis of the tank is indicated by the inner dial. The outer dial is adjustable for any gun reference position and is used to read the number of mils the gun has been traversed from the set dial position. Figure 7 shows the dial assembly on the indicator and figure 8 relates its position in the turret.

The photographs on these pages were taken from the U.S. Army manual titled 'Tank Gunnery', and they show equipment which was in use during the Second World War. Indirect fire equipment did not change radically in the post-war years, and the U.S. Army continued to utilize similar items of equipment through the M48 series of tanks.

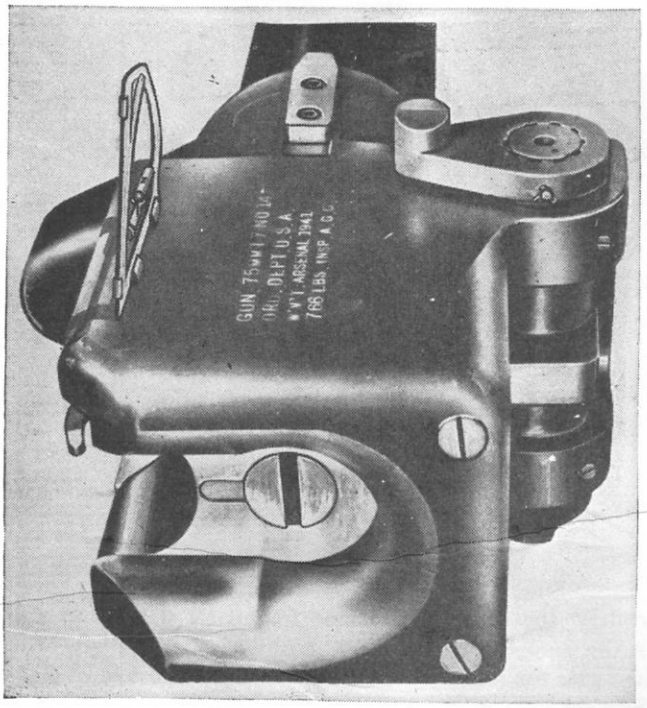

Figure 5: Position of the gunner's quadrant on the breech ring of the M3 75-mm gun of the M4 Sherman.

The M1918 panoramic machinegun sight is equipped with a tripod and is used as an aiming circle. Normally, the platoon commander, or an observer designated by him, employs the panoramic sight to correct platoon fire. The instrument consists of a low power telescope mounted on a horizontal circular table graduated in mils. This sight is shown in figure 9.

CONDUCT OF INDIRECT FIRES

To line in the tanks under his control and the target, the observer of a roving battery placed himself in a position where he could not be seen by the enemy. He commanded to his tanks: "Aiming point, this instrument," upon which each gunner sighted in on the machinegun sight. The observer successively sighted in on his tanks and read the deflection value for each of them from his sight scale. The appropriate deflection was set on the azimuth dial of each tank and when the turrets were traversed to their respective zero azimuths, all guns were laid in parallel. If the observer planed to move from his position, he set up an aiming stake at the point where he laid in the guns. Immediately following this parallel laying the observer calculated, via the standard mil formula, the deviation required to shift the guns onto the target. Firing then ensued.

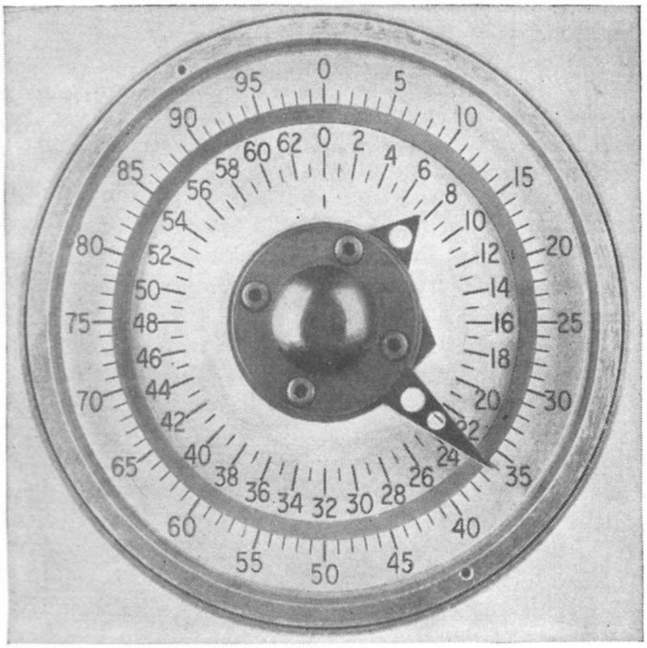

Figure 7: The azimuth indicator dial assembly.

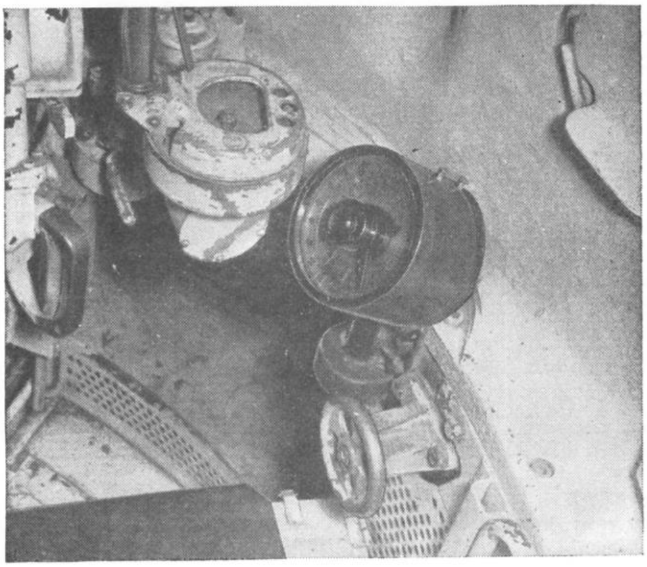

Figure 8: Position of the azimuth indicator in the turret of the M4 Sherman tank.

When tanks or tank destroyers were used as auxilliary artillery, the artillery command frequently staked out a line on the ground near the firing position. The artillery officer then gave the platoon commander an angle to use in laying the tanks for deflection. A machinegun sight or aiming circle was accurately set up on the line. The sight was set with the angle provided by the artillery officer and sighted to the one stake on the line which made the angle point toward the target. with the instrument laid on target, the individual tanks were paralleled as in the roving battery.

In adjusting fires, the observer stayed as close to the line of fire as the terrain permitted, since increasing distances to the flank distorted his range and deflection sensings. To adjust fires, the gunner was ordered to fire a round into an area where the observer could see it burst. Then, measuring the deviation of this round from the target, the observer gave commands for changes in direction and elevation (range) which would bring the next round onto or close by the target for deflection and bracket it for range. The observer could measure the deviation by means of the mil scale in his field glasses or by using the finger or hand technique (observer memorizes the mil-width of his hand, fist and fingers when held at arm's length from the eye). Having determined the deflection correction, the gunner was ordered to traverse the required number of mils. The gunner accomplished this by traversing the turret until the top pointer of the azimuth indicator moved this number of mils in the appropriate direction. In laying for range, the observer estimated the tanks-to-target range and, using the firing table, converted this range into mils. The gunner, using the gunner's quadrant for his initial laying, switched to the graduated handwheel for range changes. The observer made range changes by an arbitrary amount of 400 yards minimum unless he saw the

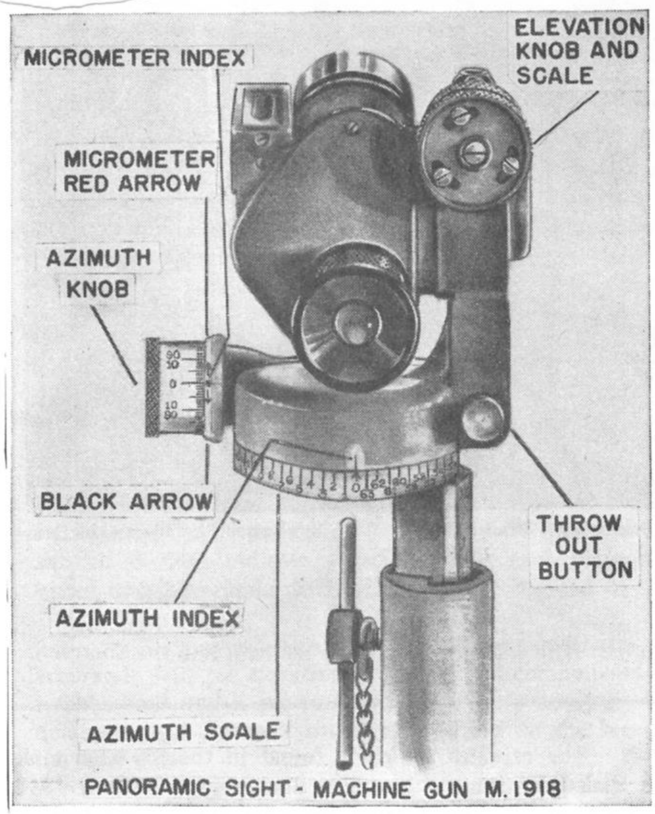

Figure 9: The panoramic machinegun sight M1918.

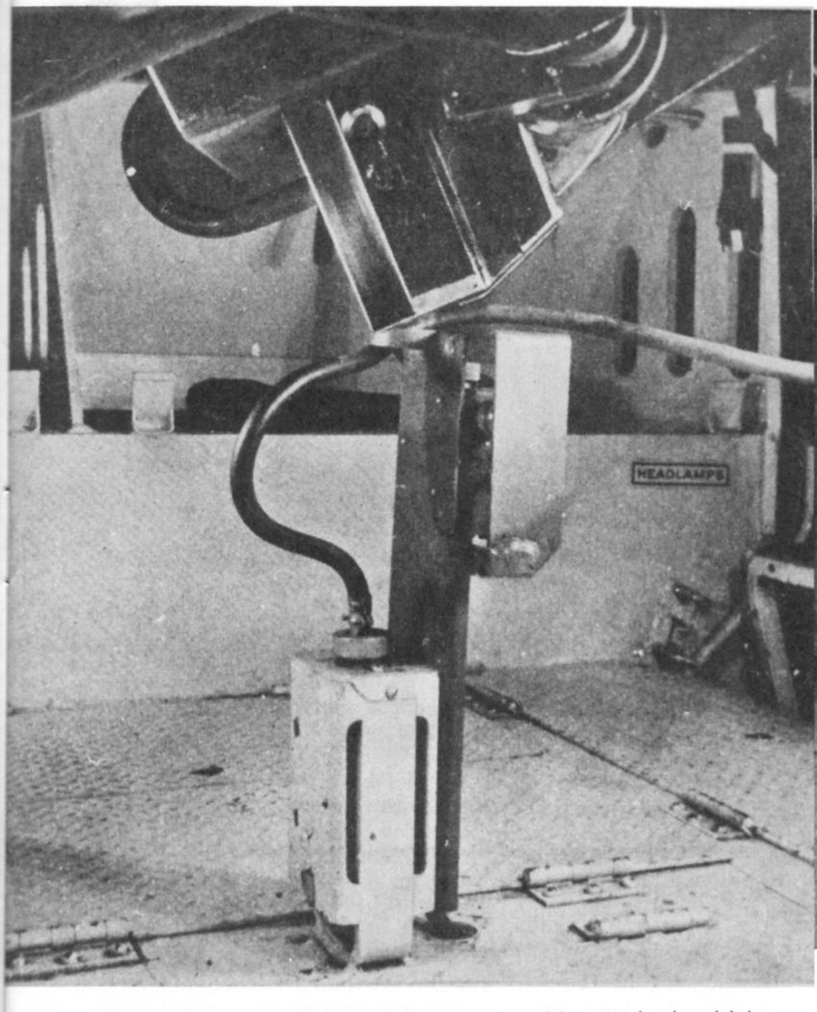

Photo above: M10 tank destroyer with standard vehicle interphone mounting. The position and height of this installation limited gun elevation.

round burst close to the target. As creeping up to a target was a typical error of inexperienced observers, range changes were to be bold enough to insure a bracket with the subsequent round. After this bracket was obtained, further adjustments were made by splitting the bracket successively until effective fire fell on the target. (Note: effective fire essentially means hitting the target with 50% of the rounds fired.) To keep all guns of a platoon alligned, the other tanks in the unit followed the deflection and elevation changes of the adjusting gun. When adjusting the fire of two or more tanks, the deviation of the center of the bursts was measured.

With the correct range and deflection obtained, a salvo of all guns was fired to check on the deviation of each. In salvo fire, a flank was designated and the tank commander on that flank opened fire with one round when he was ready: the remaining tanks firing in sequence at two second intervals. When salvoes were adjusted yielding an approximate equality of overs and shorts, the fire was immediately changed to a fire for effect, a volley fire. In volley fire, each tank or tank destroyer fired the prescribed number of rounds when ready and without regard to the firings of the other guns. During this fire, the range of each volley as a whole was sensed. Fire for effect was generally conducted with all guns at a single range with the range dispersion (an intrinsic error in artillery fires) providing depth to the beaten zone.

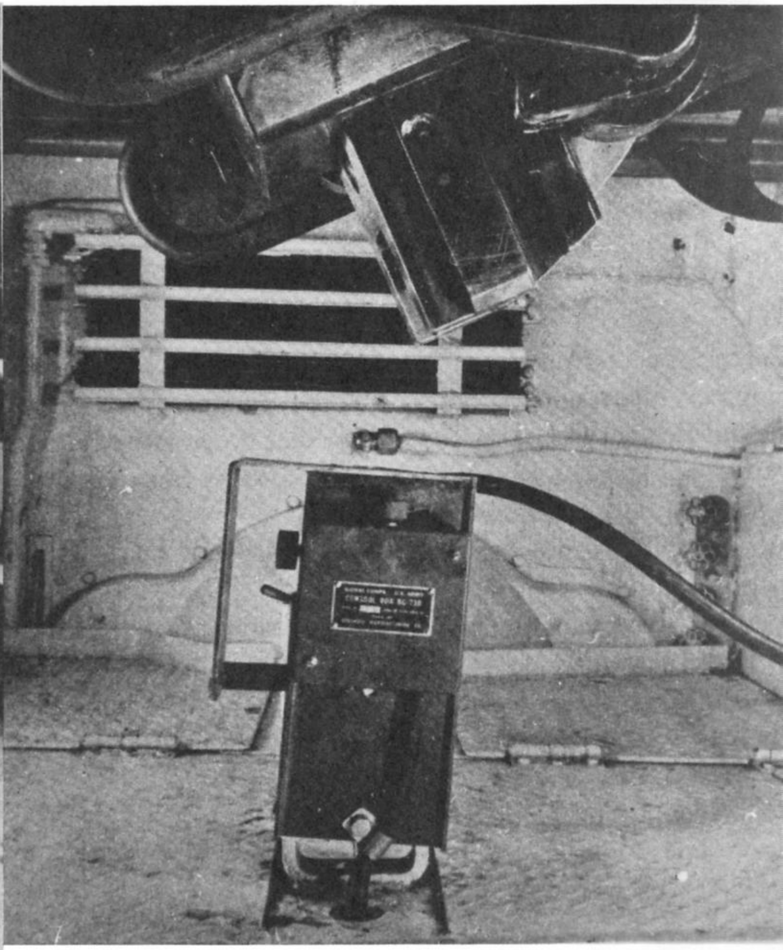

Photo above: Field modification of the interphone mount shown in the previous photo provided for increased elevation.

Firing orders in indirect laying were similar to those of direct fire. The orders and their sequence were: (1) a target description, (2) the type of ammunition to be fired, (3) the direction of turret traverse, (4) the range to target, (5) a designation of the guns to fire, (6) the method of fire to be employed and (7) the order to fire. The target description would be abbreviated such as "antitank" for antitank gun, or "doughs" for personnel on the ground. Ammunition to be fired was usually the high explosive M48 shell, designated as "HE". Initial orders had direction of traverse designated as "Aiming point this instrument." or "Deflection three zero six five". Range was given in mils on the gunner's quadrant: "Quadrant two five." Guns to fire were designated by the vehicle number in the position and included the number of rounds to be fired, thus, "Number one: one round." When more than one gun was employed in firing, either salvo or volley fire methods were ordered. The command to fire in salvo would be "Platoon right (or left)" while the command for volley fire would be "Platoon (so many) rounds". To open fire, the order was "Fire".

Thus, a typical sequence of firing orders for a platoon engaging a German 88 battery with a hundred yard indirect fire sheaf at 3000 yards might have been: "Platoon: Aiming point, this instrument; Deflection number one, two one two four, deflection number two, two one six six, deflection number three, two two zero one, deflection number four, two two four seven; Left two hundred (the correction for the observer's position); Quadrant six two; Number three, one round; Fire." A shellburst fifteen mils to the left and short produces the adjustment order: "Right one five, up five; Fire." The next burst, being three mils to the right and just over yields the command: "Left three, down one; Fire." The third burst, being on line but again just over for range causes the observer to order: "Down one; Platoon right; Fire." The subsequent salvo shellbursts, being on target prompts the observer to direct: "Platoon: five rounds; Fire." The volley, fire for effect, then ensues.

Fire techniques were refined by using a "sheaf" of fire. The "sheaf" consisted of the planes of fire for all the guns in the unit. A "converged sheaf" was one where all fires were converged on a point target. A "parallel sheaf" had all guns laid in parallel. An "open sheaf" had the directions of fire spread out from a parallel. (Refer to figure 10.) A converged sheaf was used on targets such as anti-tank guns or pillboxes while area targets were fired at using a parallel or open sheaf. In determining how open a sheaf would be, the burst of the 75-mm or 3-inch shell was considered. Since the US 75-mm M48 HE shell had an effective lateral burst of 30 yards, an area target receiving from a platoon (minus the observer) the fire of four tanks would have a maximum width of 120 yards. To provide for overlapping fire, this width was reduced to approximately 100 yards. If the tanks were positioned in the firing site at exactly this distance, a parallel sheaf was employed. If the terrain restricted the intertank spacing, an open sheaf was used to obtain the proper fall of shell spacing.

Photo above: Sherman tanks mounting 105-mm howitzers were ideally suited for conduct of indirect fires. This tank is a standard production M4 (105) designated a Sherman IB, of which 800 were produced from February through September of 1943. These were available via lend lease.

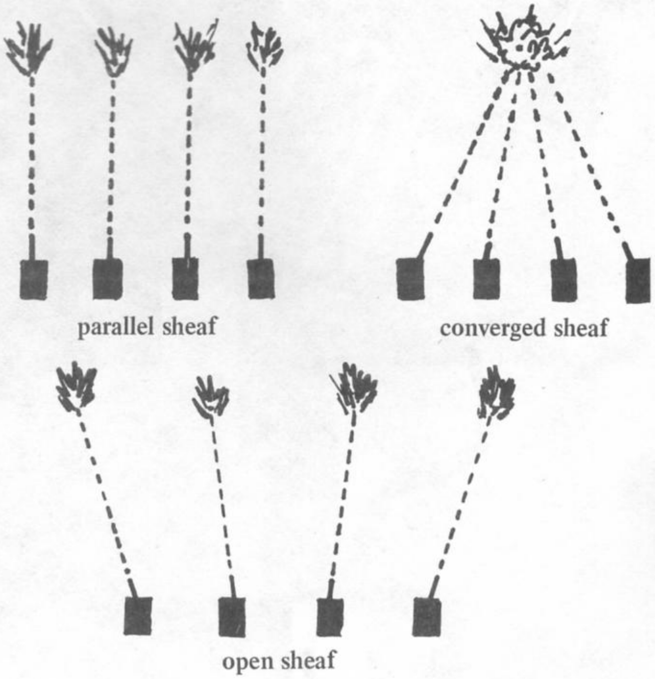

Figure 10: Illustration of sheaf types.

Success of the fire mission described above, and of the innumerable similar missions fired in the Second World War depended on the degree of the observer's skill and the proficiency of the AFV crews. An inexperienced observer, in the case above, might permit enough time for a courageous and perhaps a bit foolhardy German gun crew to limber up their 88's and move out before effective fire fell. As it happened in the example given, a well performed fire mission would eliminate a significant portion of the gun crews and persuade those remaining that it would be wiser to avoid the area. Then, with the target guns effectively immobilized, the observer could call in concentrated fire from the platoon using a converged sheaf to destroy the guns and any other targets remaining in the area.

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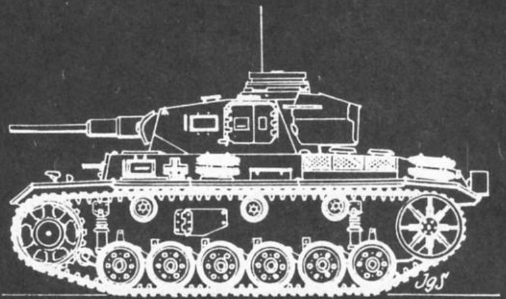
ARMOR MODELS IN REVIEW



Heller's **French 105mm Gun AMX-13 Light Tank** in 1:35th Scale

Reviewed by Wayne Larson

Heller's new 1:35th scale armor model range has been launched by an excellent model of the French AMX-13 Light Tank armed with a 105mm cannon. This kit is especially welcome as it provides a model of a vehicle not previously available in any scale, and it also extends coverage of French armored vehicles, a subject area almost totally ignored by manufacturers. This model of an AMX-13 was an excellent choice for a first model; the vehicle was France's first wholly-modern post-war armored vehicle, and the 105mm gun version still continues in front-line combat unit service. The vehicle weighs only 15-tons and is air-transportable, and the powerful armament makes the vehicle a potent tank destroyer.

Heller's new kit is extremely well molded in a matt light green (or olive) plastic which closely resembles the real vehicular paint. There are 224 parts in the kit and very little flash (if any) can be found on any of them. Tracks are cast in flat black plastic, and clear plastic lenses are provided for headlights, tail lamps and the turret-mounted searchlight. Heller has chosen to model the tank's hull in all of the component pieces of the original vehicle, instead of the more common practice of molding a one-piece hull, and all tools and extra equipment are 'add-on'; this is welcome as it permits more accurate assembly and also allows a good deal of variation during modeling. Heller's instruction booklet is in French; however, a combination English/German translation sheet is provided. The booklet's assembly drawings are clear and precise, and they are the best that I've seen in any kit to date. Two figures are provided with the kit; these depict a tank commander and a driver. Both are multi-piece in construction, and are clad in coveralls and tanker's helmet. Poses are well executed and the figures very nicely compliment the tank model. The only real fault that I could find with the kit is in the 'decal sheet', if that's what you can call it. This small, 1-inch by 1-inch sheet contains an off-color yellow bridge marking, two small turret numbers (which were off-register) and two white-on-black '*AMX 13-105*' number blocks which are supposed to serve as registration numbers. I can only comment about these 'decals' with derision; they are off register, the wrong color and are glossy. In fact, they're almost totally useless. My only advice would be to throw them away and make-up accurate markings from other decal sources.

In summary, Heller's new AMX-13 kit is extremely well done. It is accurate and very comprehensive; if you take care with assembly, painting and in marking the kit, you can easily create a museum-quality model. After building this kit, which was provided us by International Hobby Supply, I am eagerly looking forward to the next models in this Heller 1:35th scale series.

Airfix's **Sd. Kfz. 250/3 Leichter-Schutzenpanzerwagen** in 1:32nd Scale, depicting Rommel's Armored Command Vehicle 'Grief'.

Reviewed by Gary Simpson

Airfix has at long last released their model of the German *Sd. Kfz. 250/3* light armored halftrack, and this kit is, in my opinion, the 'kit of the year'; it is the most fantastic kit that has come along in this fast-pace world of armor modeling. Airfix must be praised by bringing out such an outstanding kit of this long-awaited German halftrack.

The kit contains over two hundred parts, and since it depicts the radio version, Airfix has included a beautiful *FU-8* inter-divisional radio set. That's not all, as the *250/3* has a complete interior containing everything that you could think of; it is complete in every way. The driver's and co-driver's positions are per the original vehicle, with all driver's controls. The driver's dashboard is complete in every way, with clear plastic inserts for the dials. Right next to the dashboard is a nice little *Funksprechgerät F* radio-telephone set; this is the finishing touch to make the driver's position identical to the original vehicle. All vision ports have the metal swing-out supports on the inside of the vehicle that either hold the vision slit open or closed; this is the first time that a model company has not only molded the outside vision ports, but has also included the interior portion of the vision block. This adds a lot to the interior accuracy of the vehicle. All interior stowage is included in the kit; this includes an *MP-40*, *Kar 98k*'s, a *Walther* 27mm signal pistol, an *MG-34*, *MP-40* extra magazines, a signal pistol ammo box, spare vision blocks, fire extinguisher, a gas mask container, extra *MG-34* ammo boxes, etc.... in short, the Works!

Moving to the outside of the model, the molding is again superb, and again Airfix is to be patted on their collective backs for producing such an outstanding kit. Outside stowage is complete with all items molded separately; this is the right way to produce such details as no AFV modeler wants outside stowage molded onto the kit to begin with. The vehicular suspension is beautiful; Airfix has obviously done their homework in this department, as the molding is superb and duplicates the original exactly. The tracks are good; however I feel that this is the one weak point in the kit as thei could be better. Tracks and tires are made of rubber so you won't have any trouble fitting them to the vehicle, but this choice of material is probably the reason why molding is not perfect here.

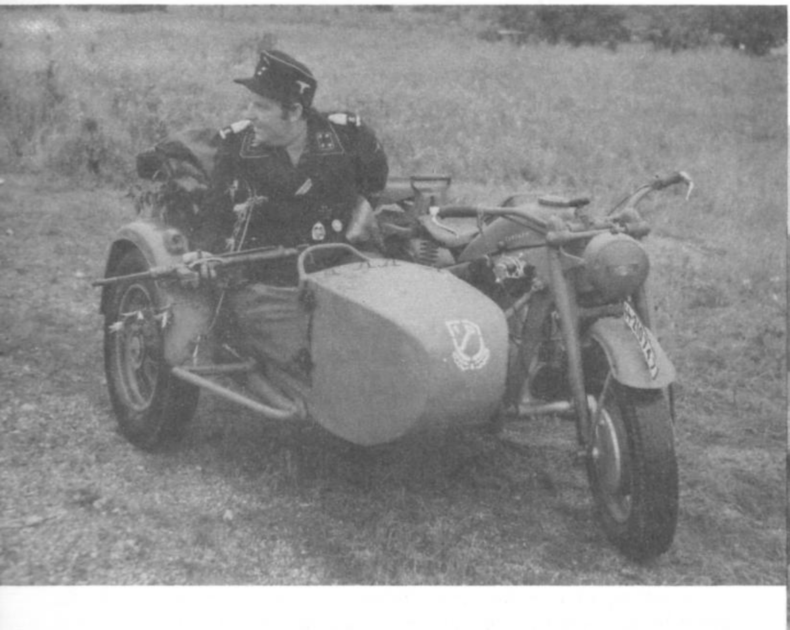
To sum up, this is a FANTASTIC kit. I can only say that I feel that this kit is the 'Kit of the Year'. My hat is off to Airfix, and I'm hoping that they will next make a *Sd. Kfz. 251* armored halftrack and then a *Sd. Kfz. 9 Famo* halftrack... wouldn't that be something!

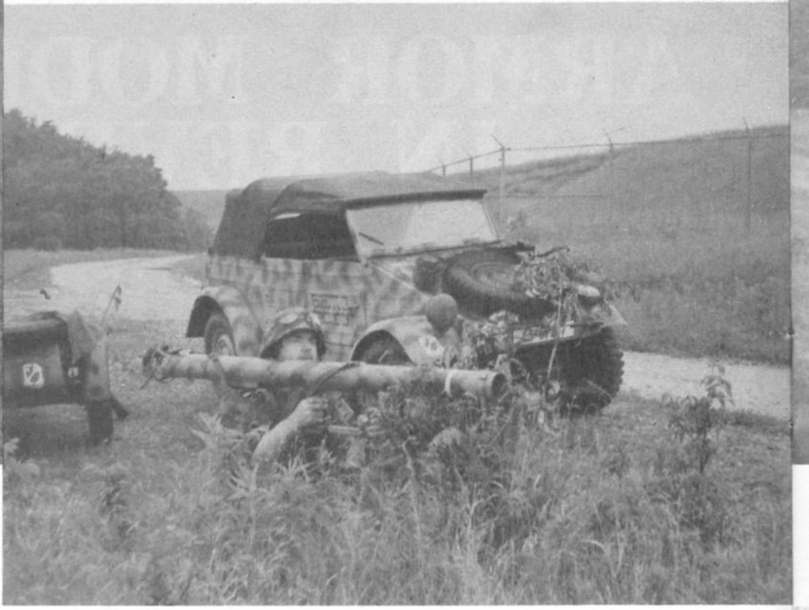
Peerless/Max's **Dodge ¾-ton Command & Reconnaissance Truck** in 1:35th Scale.

Reviewed by Duane Thomas

When the U.S. Army began vehicle standardization in the late 1930's, one of the first trucks to be created in the ½-ton and later in the ¾-ton classes was the Command & Reconnaissance Truck. This open-topped truck was used by commanders at all levels, and even after 1942, when the advent of the ¼-ton Jeep replaced many of the 'C & R's', it was still

Continued on Page 40





A PHOTO REPORT ON A . . .

Battlefield Reenactment

BY TERRY JOHNS

The photographs on these pages were taken on Memorial Day of 1975, during a World War II. European Theater type Battle Reenactment. During this reenactment, a Second World War type battle engagement was reenacted by amateurs, utilizing authentic equipment, uniforms and weapons. The purpose of this reenactment was to commerate the 30th anniversary of V-E Day, and also to give the general public a look at the dress, the weapons and the equipment of the World War II. military days.

The reenactment depicted here was held at the U.S. Army Reserve Training Center at Weldon Springs, Missouri. Over 50 people participated, coming to the site from all over the country. These persons brought their own personal authentic uniforms, weapons, military vehicles and aircraft. A reenactment staff worked out a plausible scenario for the mock battle and the participants enthusiastically took part in what turned out to be an unique experience. The even was made possible by the sponsorship of the Missouri Army National Guard and the Historic Military Museum of Missouri, located at Fenton, Missouri.

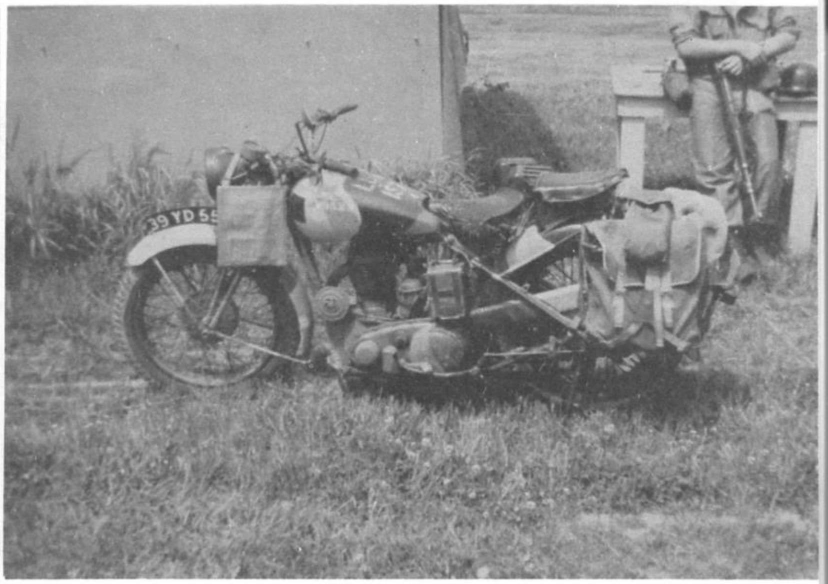
The battlefield reenactment was judged so successful that future events are being scheduled on a regular basis, and are being advertised more widely, both to attract spectators and participants. The reenactment staff would like to invite all World War II. veterans and their families, as well as the general public to attend and view or participate in the next reenactment. If you'd like more information on coming events, please contact:

Terry L. Johns
Reenactment Coordinator
1780 Clover Lane
Florissant, Missouri 63031
Phone: 314-552-6781

Above: The 750cc Zundapp *motorcycle with a 'German'* Waffen-SS *officer in the sidecar. Note the SS license plate and the tactical markings for* SS-Panzergrenadier-Regiment 1. *Efforts were made throughout the re-enactment for all participants to wear correct uniforms and bear correct weapons.*

Above: This photo shows two of the 'German' vehicles; on the left, the rear of a Zundapp *motorcycle, and at the right, a* Volkswagen Typ 82 Kübelwagen. *In the foreground, one of the German drivers defends the position with a* Panzerschreck.

Above: An Allied M-20 Armored Utility Vehicle in correct Normandy-period markings, complete with four-man crew, moves through the Weldon Spring USAR Training Center, looking for the 'enemy'.



Above: An ex-British Army BSA motorcycle was used by the Allies for messenger duties. Note the use of correct camouflage.

Above: The Allied forces were supported by aerial observation; this nicely restored L-3 is complete with 1941-43 period stars.

Above: Some of the 'German' participants gather for a conversation, while in the background, crew members worn on an Allied halftrack mounting twin .50-caliber machine guns.

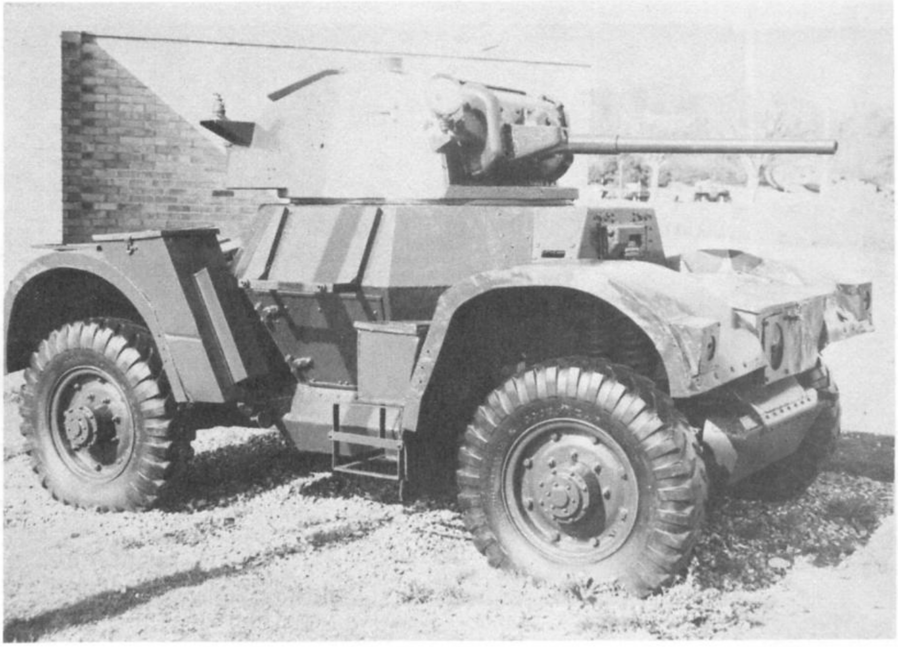
Above: A view from the interior of the Kübelwagen *while going into action. Note the pedestal-mounted* MG42 *and the German medic at right.*

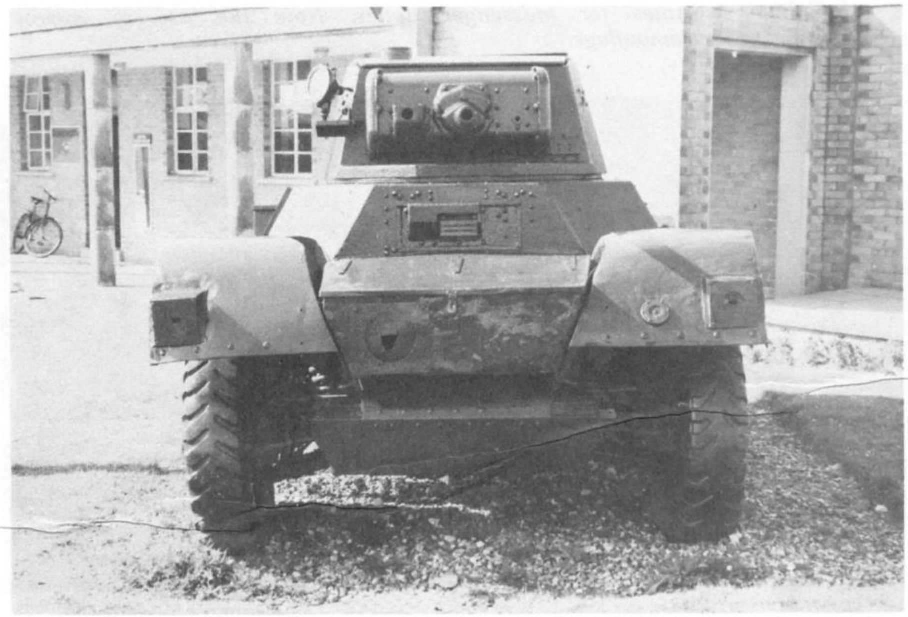
Above: A 'captured' Allied M-20 Armored Car with a German soldier on the back deck. Note the spectators in the background.

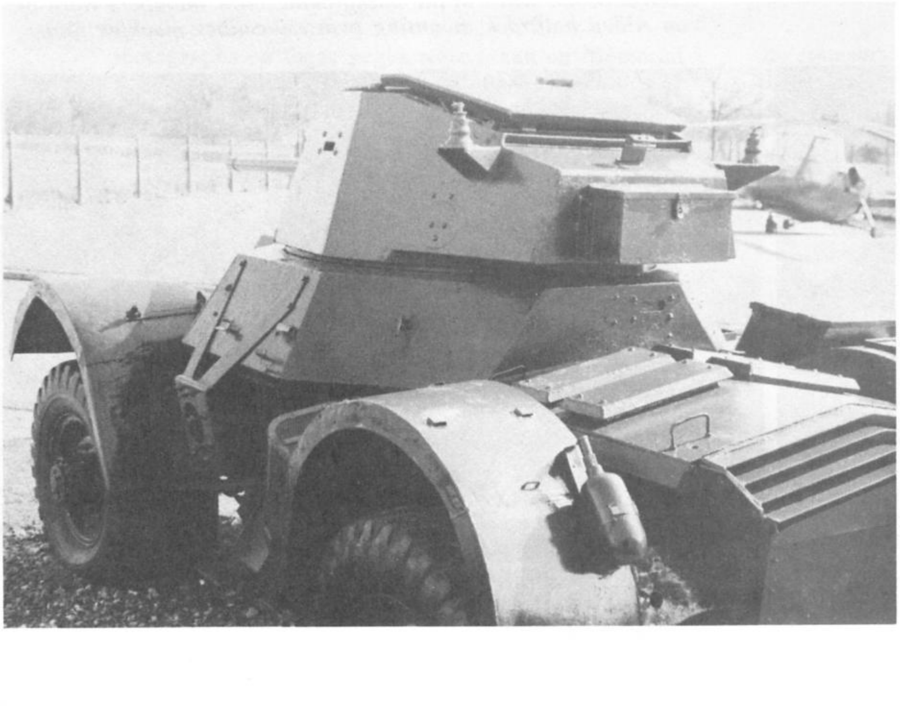
Vehicle Close-up:

The Daimler Mark I. Armoured Car

by Sgt. Gary Simpson







For some reason, the Daimler Armoured Car Mk.I has been virtually ignored in AFV publications. With the advant of the *Bandai* kit of this basic vehicle, it is appropriate that we provide a few 'close-up' photos on this particular vehicle, both to assist modelers and to create a pictorial record of this interesting wartime armored car.

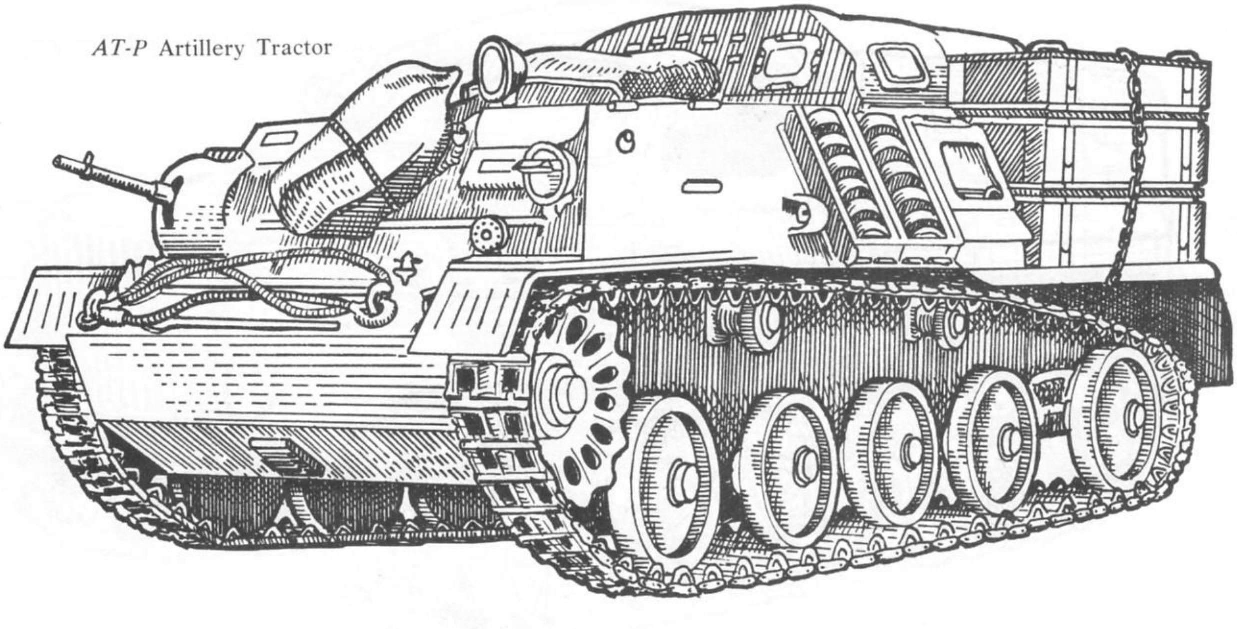
The vehicle shown in this pictures is on display at one of the training schools at the Royal Armoured Corps Centre, Bovington Camp, England. As can be seen in the photos, the vehicle is in a reasonable state of preservation, although it is in need of repainting and marking.

The photo at the top of the page shows a ¾-front view of the right side of the Daimler. Barely seen behind the front wheel are the two spiral springs of the front suspension. Note the turret spot light and the antenna bracket at the turret rear, as well as the side escape hatch, the tool boxes and the side vision ports for the driver and commander. Although the turret 2-pounder armament is still present, the coaxial 7.92mm Besa machine gun is missing from its mount.

The center photo shows a frontal view of the Daimler. Note the driver's vision port and hatch and the unusual headlight containers on the fenders. The turret mantlet is an unusually-shaped one which is difficult to describe.

The bottom photo is a ¾-rear view which shows the turret shape well. Note the second antenna mount, the tool box at the rear of the turret and the pecular sliding turret roof hatch. Also shown are the engine decking hatches and the driver's rear vision port (just below the turret tool box); this latter port was a vital necessity in driving to the rear. Note the fire extinguisher (on near fender) and the spare tire bracket. The muffler is located on the front of the near fender and it appears that the exhaust piping is missing from this car.

The Daimler Marks I. and II. appear nearly identical to the eye; these vehicles were powered by a 6-cylinder, 95-horsepower engine which gave them a reasonable speed on roads. Weighing 7¾-tons (fully loaded), the Daimler was crewed by three; a Commander, a Gunner and a Driver.



AT-P Artillery Tractor

Soviet Artillery Tractors & Transporters

The manner in which Soviet artillery gunners perform their combat duties is dependent to a large degree upon the characteristics and performance capability of the artillery tractor and the skill of its driver.

In order that the Artillery can keep up with Motorized Infantry units when on the march, the artillery tractors must be very mobile and have a good cross-country performance. The lack of roads, mud and snow must not impede their advance. High performance engines, wide tracks or low pressure oversized tires, multiple gear ratios, and reliable towing mechanisms provide this necessary performance. In this article, the Artillery Tractors and Tracked Transporters will be examined in some detail.

Various artillery tractors are employed in the Soviet Army in accordance with the caliber and size of the artillery weapons. Light guns are towed by the *AT-L* and *AT-P*; medium guns by the *AT-S*; and heavy weapons by the *AT-T*. These vehicles carry the gun crews, together with the necessary equipment and accessories. For this purpose, they are equipped with a tarpaulin-covered cargo area and seats.

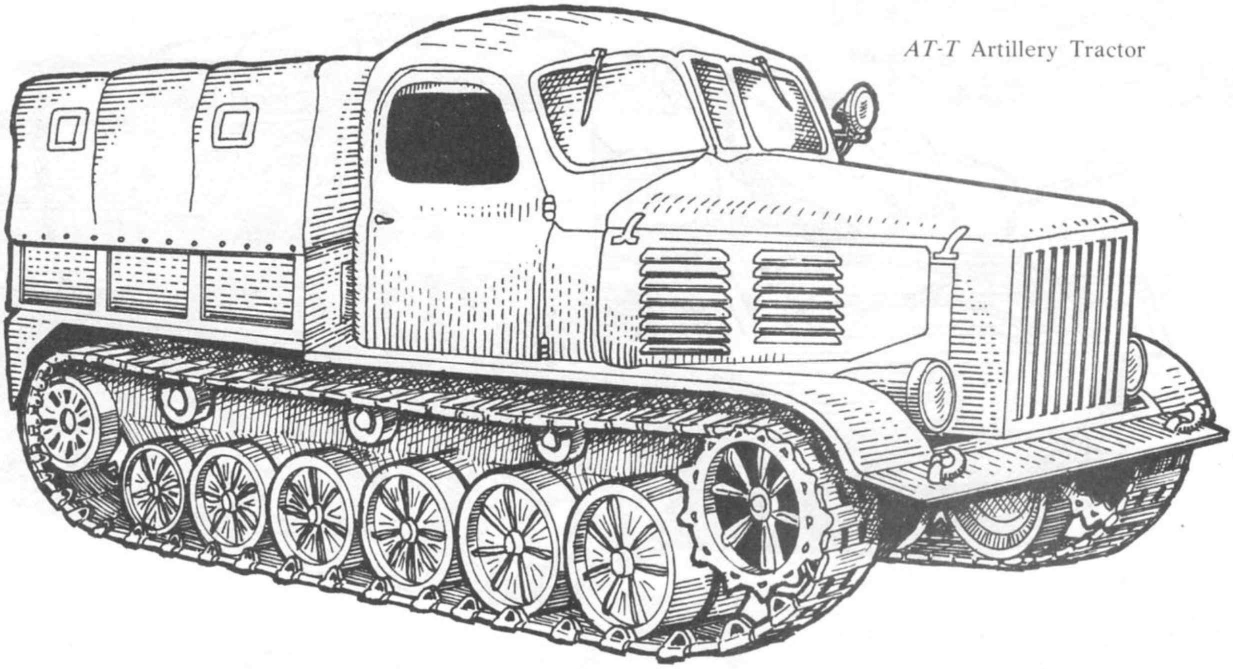
The excellent mobility of these artillery tractors is due to a powerful engine (with output up to 400 horsepower) and a practical road wheel-suspension system. With the *AT-P* and *AT-L* models, the roadwheels (or bogies) are independently suspended on coil springs. The front roadwheels of the *AT-P* are, in addition, equipped with double-action hydraulic shock absorbers.

In most of these Soviet tractors, the engine and power transmission system are in one unit, and both are located in the front of the vehicle. In these models, the drive wheel sprockets are at the front and the idler wheels are at the rear (*AT-L*, *AT-T*). With the *AT-S*, the opposite is the case. In all cases, the tractors are steered the same as a tank, in other words, with steering bars which regulate the track speed by means of the steering clutch or epicycling steering gears.

The different tractor engines are, as a general rule, very similar to tank or other military vehicle engines. They are diesels with a reliable self-starting and air filtering systems. In addition to an electric starting systems, the *AT-T* has a compressed air starter. In the winter, a pre-heating device makes for easy engine starting. Special heaters warm the cabs of the *GT-S* transporter. The *GT-T* tracked transporter is powered by a 6-cylinder diesel engine. To ensure good engine cooling (particularioly in hot climates), some vehicles are equipped with an air injection system in which cool air is drawn into the fuel mixture chambers behind the injector nozzles by the action of rapidly escaping exhaust gases from the manifold.

Dust stirred up by the action of the tracks would cause severe wear and tear if it got into the engine cylinders. Therefore, tractor engines are equipped with an effective multi-stage air filtration system. For example, in the *GT-T* tracked transporter, air drawn into the combustion chamber is cleaned in 42 'cyclone' air filters and one oil-contact filter.

In addition to serving as artillery prime movers, the tractors can be used as recovery vehicles for disabled equipment. The vehicle itself has a self-recovery capability if it becomes bogged down, since most models are equipped with a winch and a chain hoist. Damaged vehicles are towed by the



AT-T Artillery Tractor

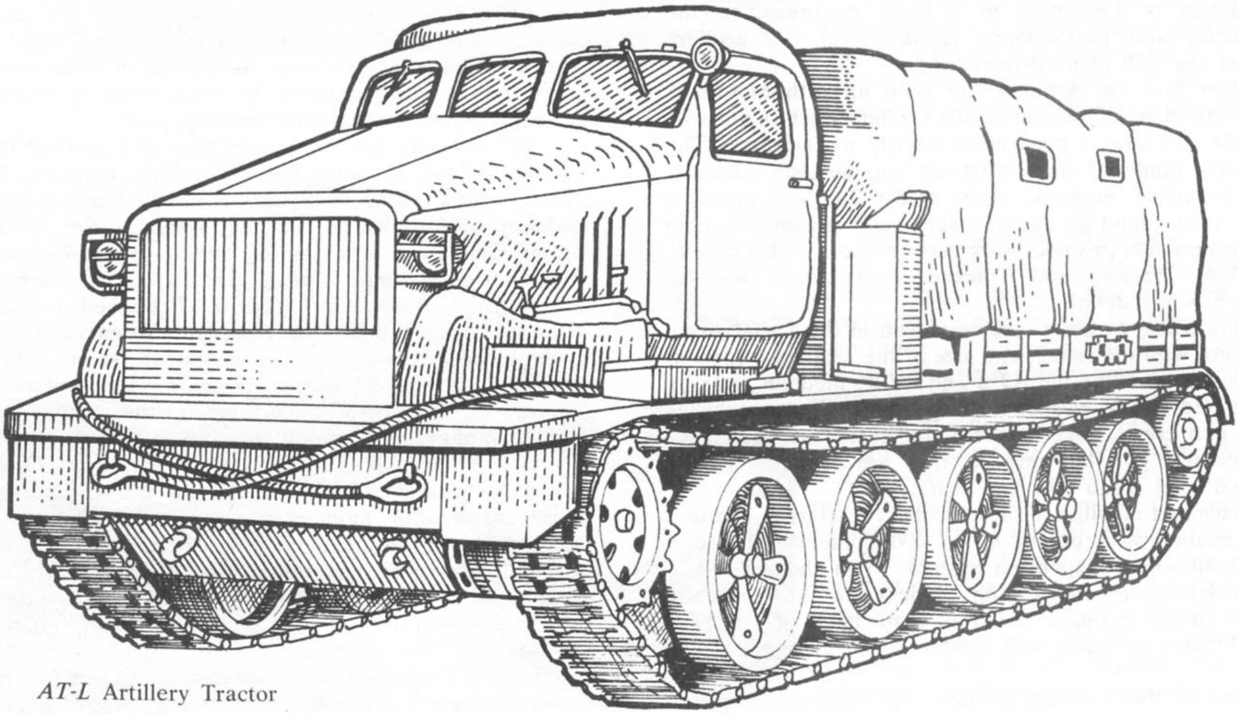
tractors to an equipment recovery point or to a rear area.

Soviet tracked transporters serve other purposes. They are used for the transport of ammunition, fuel and lubricants for Motorized Rifle, Armored and Artillery units; as liaison and command vehicles; as ambulances; and additionally for the transport of light artillery weapons and mortars.

These transporters are build with a self-supporting, armored superstructure (without frame) which absorbs all the dynamic stresses and strains from the tracks while on the move. A totally closed, welded hull provides the transporters with an amphibious capability. For propulsion in the water, these vehicles are equipped with a water-jet drive system (patterend after that of the *PT-76*) which produces a speed of 5 to 6 kilometers per hour.. The vehicles, in addition, can propel themselves by means of their tracks alone.

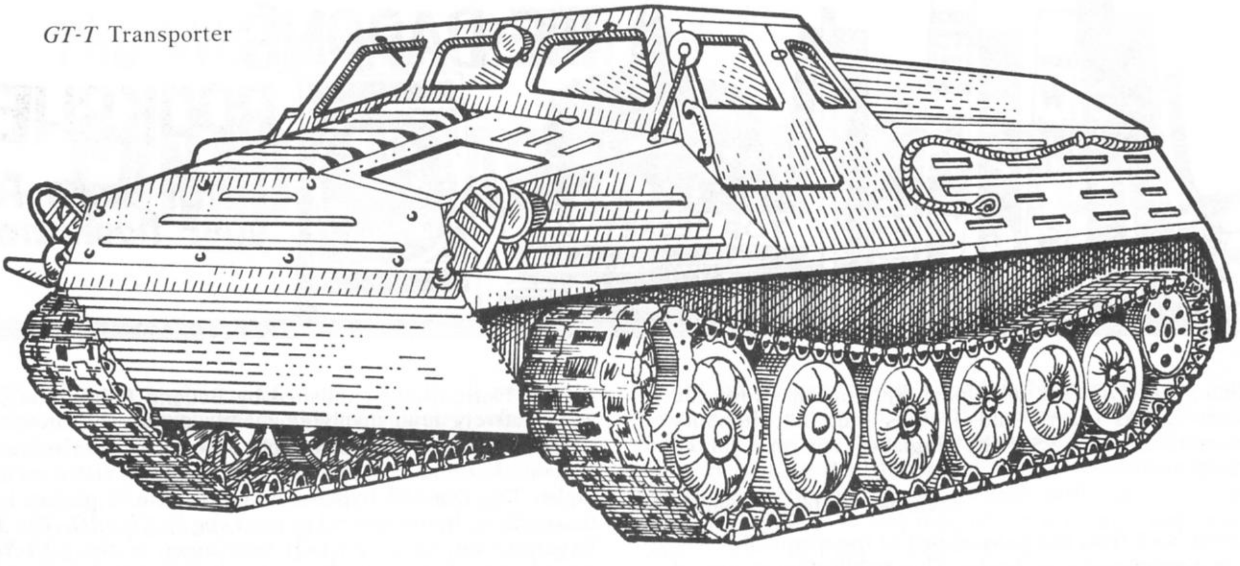
Track transporters differ from artillery tractors in ways other than their amphibious capability. They can also be driven over swampy ground, loose snow and deep sand. This is mainly due to the low ground pressure of these units. With the *GT-S* and *GT-T* models, this ground pressure amounts to only .24 kilopounds per square centimeter; only about one half of the normal ground pressure exerted by artillery tractors or tanks.

Sovet tracked artillery tractors, as well as the tracked transports, provide a highly effecient means of transport. In order to make full effective use of their combat characteristics, the vehicle drivers and crews must be highly trained. The tracked artillery tractors and transporters are supplemented by a great number of modern, all-wheel drive, 2, 3 and 4 axled, wheeled vehicles, which also possess good cross-country performance. On roads and over moderate terrain, these wheeled vehicles perform better than the tracked vehicles.



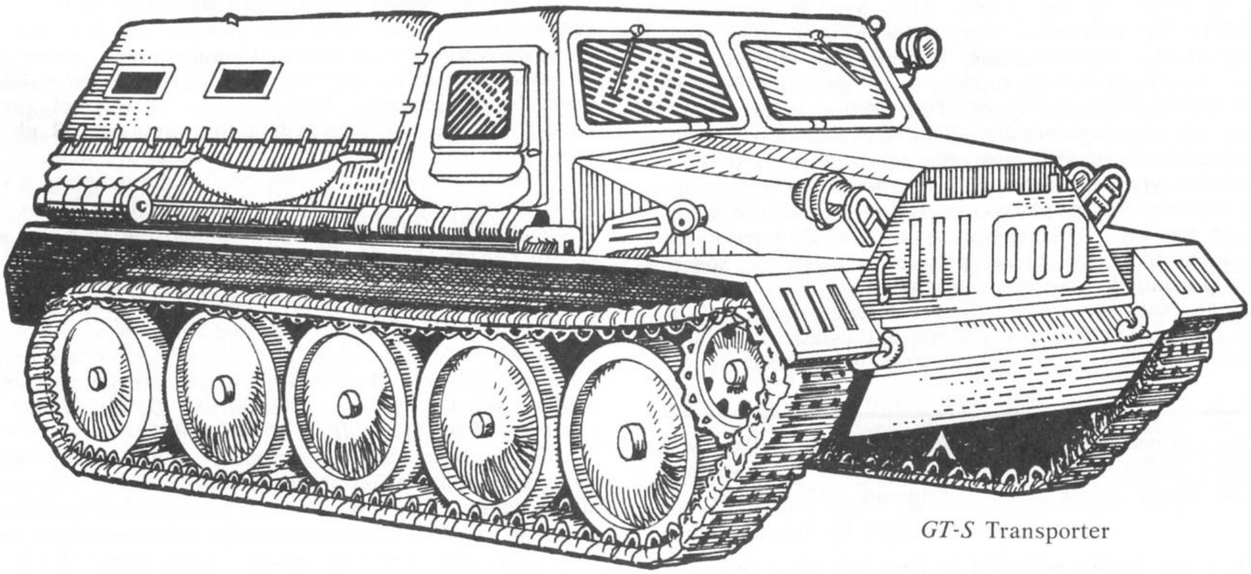
AT-L Artillery Tractor

GT-T Transporter



TECHNICAL DATA	*ARTILLERY TRACTORS*			*TRACKED TRANSPORTERS*	
	AT-P	*AT-L*	*AT-T*	*GT-T*	*GT-S*
Total Weight in kg.	7200	8300	25,000	10,200	4650
Max. Trailer Weight in kg.	3700	6000	25,000	4000	2000
Ground Pressure in kp/cm^2	.40-.47	.45	.60	.24	.24
Clearance in mm.	330	350	425	450	400
Max.Speed in km/hr.	50	42	35	45	35
Fording Depth in mm.	700	1000	1000	amphib.	amphib.
Engine Type	ZIL-123F	JaAS-204	A-401	13-6	GAZ-47
Horsepower	110	130	415	200	85

This article originally appeared as 'Soviet Tracked Artillery Tractors and Transporters' [Sowjetische Geiskettenzugmittel und Transporter] in the East German magazine 'Militärtechnik, July 1973.



GT-S Transporter

Book Review: *Encyclopedia of Tanks*, by Duncan Crow and Robert J. Icks (Barrie and Jenkins Ltd., 24 Highbury Crescent, London N5 1RX, England, 256 pp., illus., £12.50 net)

Reviewed by James Steuard

The latest book from the pens of two of the deans of armor historians is *Encyclopedia of Tanks*. This publication is one of those books destined to become a standard reference work in the field of armor, as it provides a tremendous amount of reference material on tanks in 256 pp. While it is an expensive publication, it is probably the best single armor reference book that you can buy.

The publication is divided into three main sections. Part one is an overview of armored vehicle types and their uses. The text is not arranged in any sort of alphabetical or indexed order, but consists of a number of chapters covering armored topics in a book-like manner. Separate chapters cover: Early Development; Tanks, Tankettes, and Carriers; Self Propelled Weapons; Mine-Defeating Vehicles; Bridging and Engineering Vehicles; Armored Personnel Carriers and Command and Miscellaneous Vehicles.

Part two is devoted to coverage of Tank Characteristics and Sub-systems. Like the first section, material is presented in text form, covering systems in separate chapters. These chapters provide coverage of: Tank Design; Armament, Fire Control and Vision; Turret and Hull; Power Plants; Power Trains; etc. Excellent photos are sprinkled throughout parts one and two, and many of these are rare and unusual. Quite often, photo subjects are quite esoteric, and while welcome, one gets the impression of a tremendous number of photos which were left out due to space restrictions.

Part three of this book is perhaps the most interesting for dedicated armor enthusiasts, as it provides a vehicle-by-vehicle coverage of armor of the world. This part is organized alphabeticallty by countries, starting with Argentina and proceeding through forty nations, ending with Yugoslavia. Vehicles are listed usually with three or more lines, in a fashion serving to identify fully the types. This section is extremely comprehensive, covering virtuallty all vehicles that deserve the name of 'tank'. Even the most dedicated enthusiast will discover vehicle types completely unknown to him. This section contains a number of small photos illustrating some of the more choice items, and my only complaint is that I would have liked to have seen more of these pictures. Obviously space restrictions precluded these extra photos.

All in all, this is a tremendous reference work and it belongs on the book shelf of every armor enthusiast. If you are looking for that special Christmas present, this is a good one to ask for.

Book Review: *Imperial Japanese Tanks 1918-1945*, by Paul M. Roland (Bellona Publications, Argus Books Ltd., Station Road, Kings Langley, Herts, England, 1975, £1.25)

Reviewed by Robert J. Icks

This is a new booklet authored by Paul Roland of Ormond Beach, Florida, and published by Bellona Publications. Errors are relatively few, involving mainly picture attributes, a few vehicle titles and a bit of vehicle description. For example, the Renault *KO* and *OTSU-B* (not *ETSU-B*) are listed as medium tanks. The *Type 89* Experimental Tank No. 2 picture is not of that vehicle, but is instead of the *Type 89 CHI-RO*. The *Type 89* Experimental Tank or *I-GO*, forerunner of the *CHI-RO*, was considered a light tank. It can be distinguished from the latter by the absence of a turret cupola, an entry door which slopes inward toward the bottom on the right and a wedge-shaped section built out on the left for the driver's legs. Other than these errors, the are few faults in this little volume which comprises a great deal of worthwhile information in a small space. The book sells for £1.25 net and is well worth the price to anyone interested in the story of Japanese tank development, use and vehicle data.

Book Review: *Pz. Kpfw. IV. in Action*, by Bruce Culver and illustrated by Don Greer (Squadron/Signal Publications, 3461 E. Ten Mile Road, Warren, MI 48091, $3.95)

Reviewed by James Steuard

The newest armor publication from Squadron/Signal is, as the title suggests, a pictorial work on the German *Panzer IV.* medium tank, a vehicle which certainly deserved its reputation as the 'Workhorse' of German tanks. This book follows the recent *Panther* publication is layout and format, as it should since its by the same author. After a brief introduction, which covers the development of the basic *Panzer IV.*, the various sections of the book cover the vehicle series in chronological order, starting with the *Ausführung A*. As with the *Panther* book, text has been expanded and provides a welcome and generally accurate look at each vehicle variant, explaining the numerous differing details and providing good technical data. There are numerous small detail drawings, serving both to acquaint the reader with the various vehicles and also to illustrate variant differences. Photo content seems to have lessened in quantity over previous 'armor series' publications; down to 79 pictures. However, the quality of the photo illustrations has not dropped in the slightest; all photos are crisp and clear, and virtually all of them are new.

The colored artwork in this publication deserves a separate mention as it is a departure from previous books by this company. The front cover is typical, showing an action drawing of two *Panzer IV., Ausführung H*'s in a snowy winter scene. The centerspread and the rear cover art shows twelve, side-view colored profiles in approximate 1:48th scale. All of these profiles are very well executed and they will be welcomed by modelers wishing to have accurately-done reference color schemes. The artwork covers the major wartime variants of the vehicle, starting with the *Ausführung D*; six of the profiles cover the *Ausführung H*.

There have been a number of generally well-done publications on the German *Panzer IV.* I think, after reviewing all of them, that this new Squadron/Signal publication is probably the most useful, especially to those who are modelers and dedicated German armor enthusiasts. It is highly recommended.

The World War 2 Period

CANADIAN ARTILLERY TRACTOR

by David Swenson

In 1939, after the beginning of World War II., it quickly became evident that British production of military soft-skin transport vehicles was inadequate to meet the expected demands of war. Not only was British industry directly exposed to the war, through the bombing efforts of the *Luftwaffe*, the anticipated demands for transport far exceeded available production capability. Losses at Dunkirk in 1940 placed additional re-equipment demands on an already pressed industry. Ideally, what Britain needed was an industrial base which was immune from war damage and which was capable of rapid expansion to meet increasing needs. Of course, such a 'base' must be close to the necessary raw materials, as well as to a good source of manpower. The answer to these requirements was Canada.

Once the decision was made to utilize Canadian production as the main solution to Britain's (and the Commonwealth's) requirements, the problem was approached in two phases. First of these was an early reliance on conversion of civilian vehicle types to a military configuration, based on British experience. During this phase, plans were formulated for a new line of 'standardized' military trucks. These plans meant that all production facilities within Canada would concentrate on production of a series of standard trucks, ranging in size from 8-cwt. to 30-cwt. These vehicles would utilize a standard series of chassis with a high degree of common part interchange. Since the major facilities in Canada were General Motors and Ford, both the in-line 6-cylinder Chevrolet engine and the Ford V-8 engine were to be utilized in these vehicles. After the plans for the production of this series of vehicles were approved, the next phase involved the expansion and conversion of the Canadian industry to meet the production requirements for the new series of vehicles.

Since the Canadian plans were for concentration on middle-range capacity vehicles, other sources had to be found for light and heavy truck requirements. The solution to these requirements was found in the United States, which provided ¼-ton 'Jeeps' and heavy tractor-trailer vehicles under the Lend-Lease program. Most of these heavier vehicles were simple adaptions of civilian models already in production at Mack, Rio, General Motors and Ford plants in the U.S.

Initial vehicle production in Canada, as already stated, was based on British vehicles and to a certain extent consisted of conversion of civilian models. Some of the problems encountered resulted in modifications to the new designs being rapidly proposed. One of the major efforts involved design of a standard truck cab which could be utilized on all models of vehicles. This cab passed through a number of designs, ending with what became known as the #13 Cab, which featured increased room, less cramped driving positions and a forward-slanting windshield which was designed to eliminate sun reflections which might attract attention from a distant enemy. The major difference between Ford and Chevrolet production models occured in the engine compartment area, which had to be tailored for the differences between the in-line 6-cylinder and the V-8 power plants and their accessory packages.

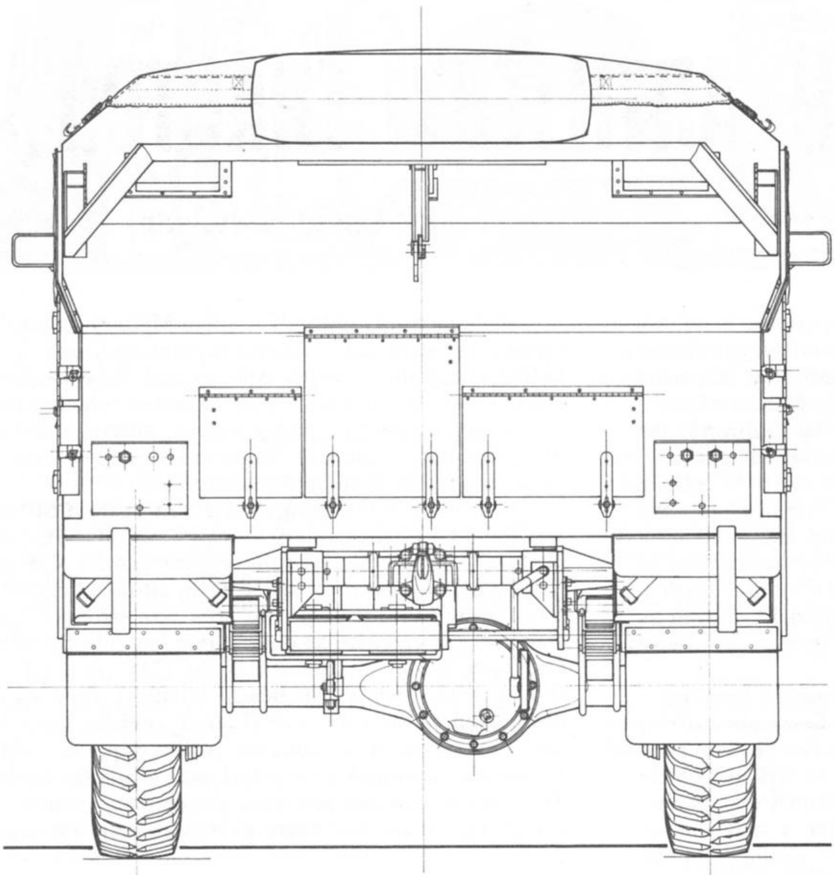
Military trucks of the 'Canadian Military Pattern' (or CMP) series were supplied to Canadian military forces, as well as to Indian, Australian, South African and New Zealand military units. Within the British Army, Canadian vehicle supplemented British production to a heavy degree, although British military units throughout the war maintained a unique look, due in no small degree to their indigenous vehicles.

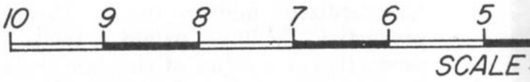
One of the major design variations in the CMP truck series was the 4 x 4 Field Artillery Tractor (or FAT). This vehicle was obviosuly patterned after the British Morris C.8 or the Guy Quad-Ant tractors; it consisted of an all-metal closed body with a canvas roll-up top. The cab area was strongly based on the standard #13 cab with an observation hatch in the cab roof. The Chevrolet model was known as the CAT or CGT (Chevrolet Gun Tractor), while the nearly identical Ford variation was designated as the FAT or FGT. Both vehicles were designed to tow the standard 25-pounder artillery piece, and also the 17-pounder anti-tank gun (which was a similar towing weight. The vehicle was crewed by a driver and an assistant driver occupying the cab and there were rear seats for a gun crew of four. The rear of the body had compartments for tools and equipment. A spare tire, a reel of telephone wire and a rolled camouflage net were carried on the roof or top of the rear deck. The vehicle had a powered winch, which could pull from front or rear; this was provided to assist in recovering stuck vehicles or to assist in retrieving artillery pieces which had been emplaced. Interior racks in the vehicle held sufficient ammunition for one engagement; for the 25-pounder artillery piece, this consisted of eight complete rounds (which consisted of projectiles and separate cartridge cases). Normally, additional ammunition was carried in the unit ammunition vehicles, and the 'ready' ammunition in the FAT was utilized as an emergency supply.

In terms of performance, both the Canadian Ford and General Motors vehicles were nearly identical. The vehicle had a top speed on roads of 46 m.p.h., a minimum turning radius of 22.5 feet, and a fording depth of 24-inches. The vehicle could pull a load of nearly 2-tons, while carrying an internal load (consisting of gun crew, baggage, ammunition, tools and equipment) of an additional 2-tons. The winch capacity was 4-tons. The average fuel consumption was 7-miles per gallon (although this did vary between the Ford and the Chevrolet models), and with a standard 42-gallon fuel tank, the range of the vehicle was nearly 300 miles. In terms of dimensions, the artillery tractors were 175-inches in length, with a wheelbase of 101-inches. The width of the tractor was 90-inches, with a track of 69-inches. The overall height was 99-inches.

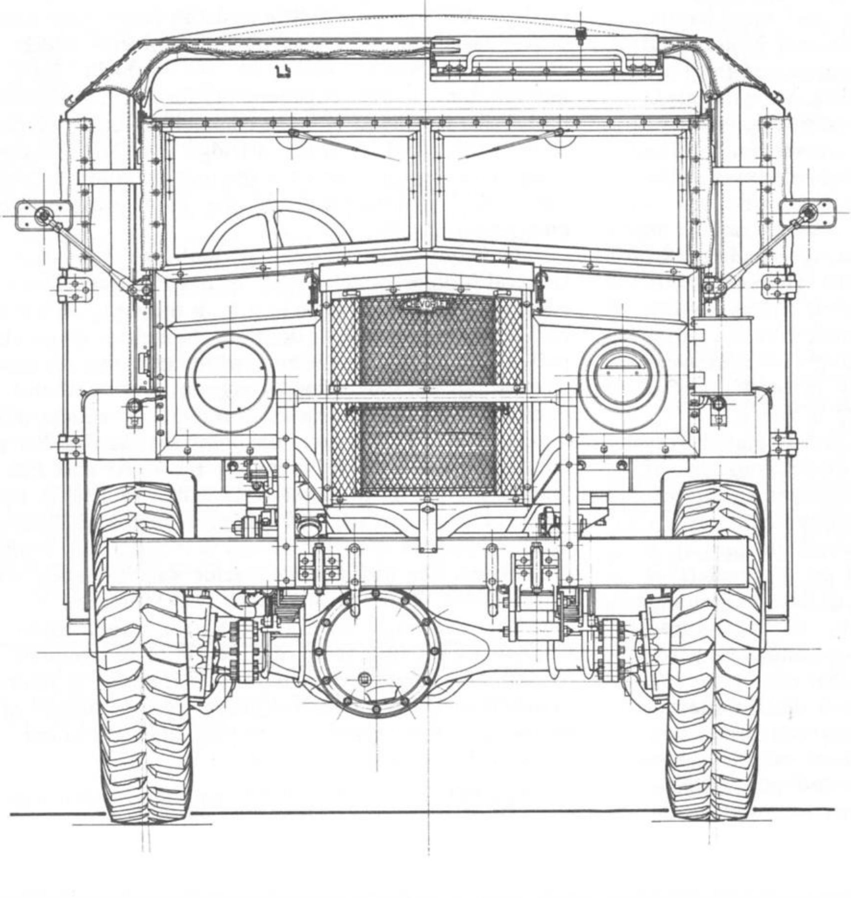
The drawings on the next two pages show a typical Canadian CGT in a scale of 1:24 (or ½-inch equals one foot). The author would be interested in obtaining information on privately-owned Canadian artillery tractors, either of the Ford or the Chevrolet types, for photographic purposes.

Canadian Chevrolet CGT



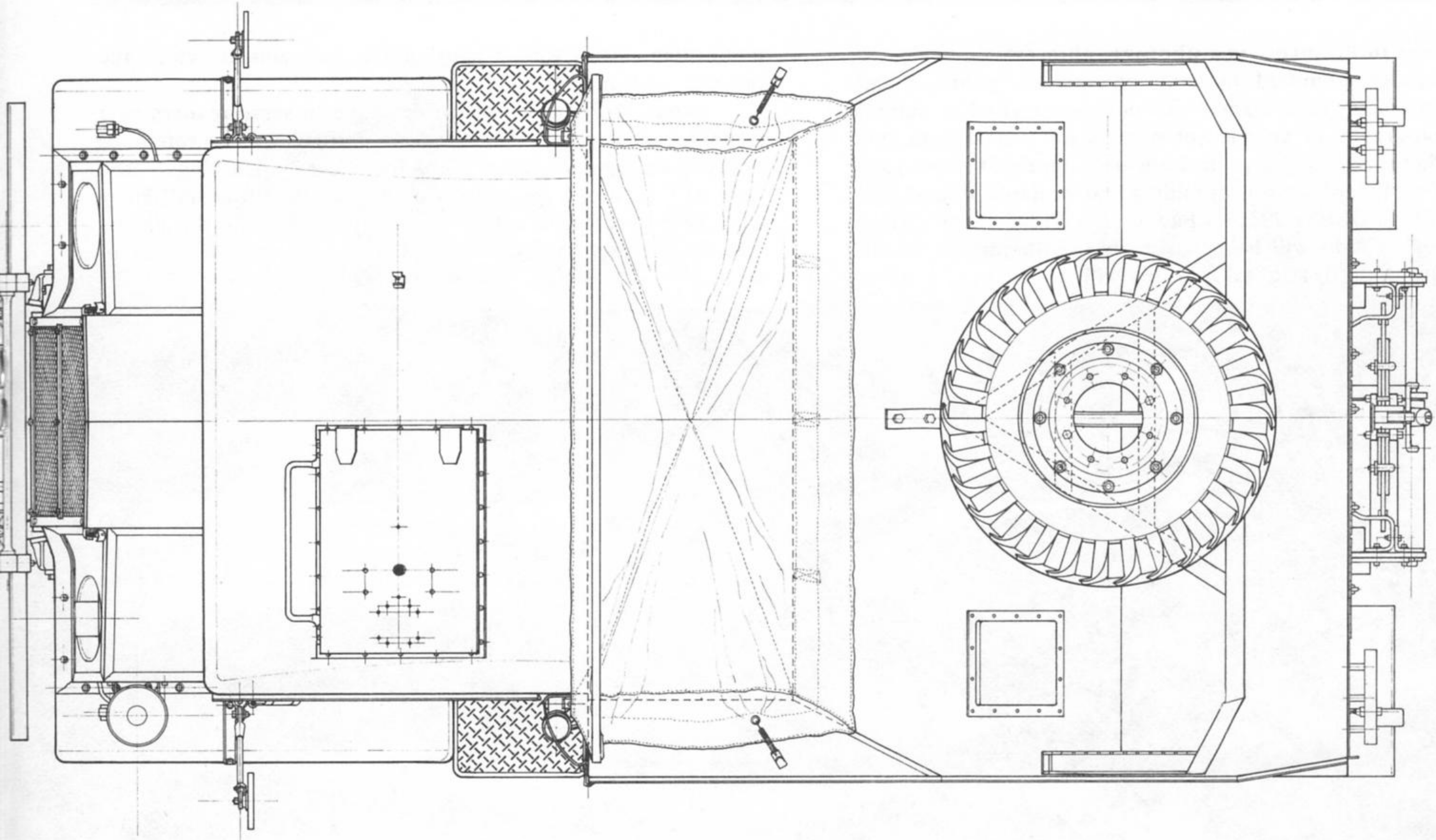


Drawn by Y. Tomioka



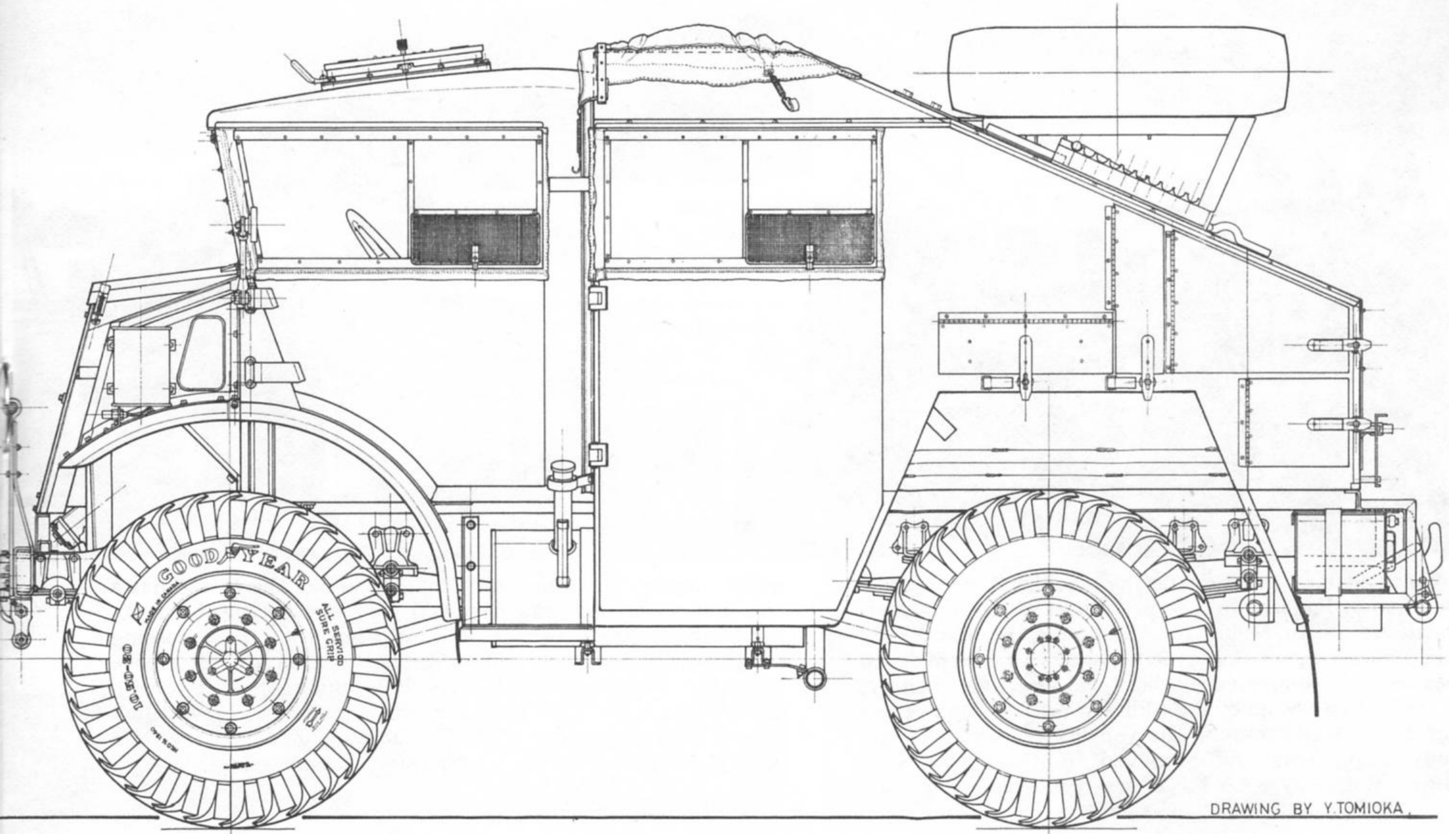
Scale: 1/24

Field Artillery Tractor



4 3 2 1 0

E: 1:24

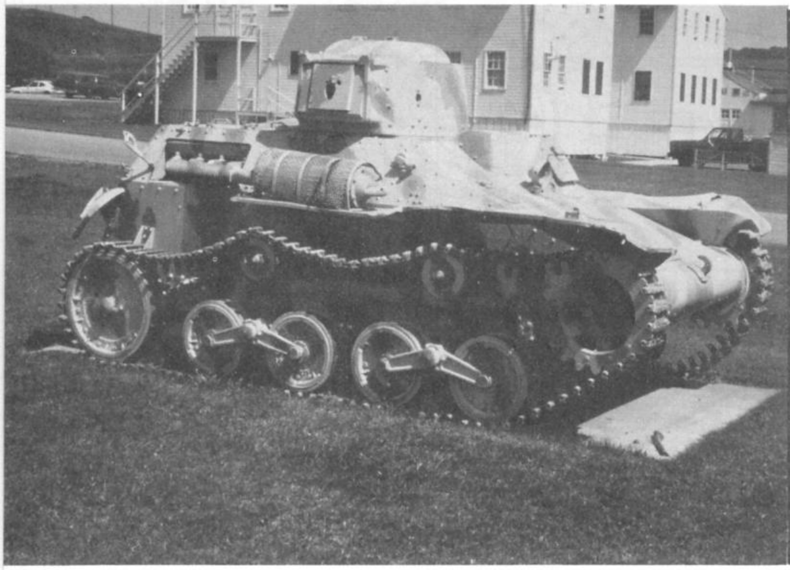


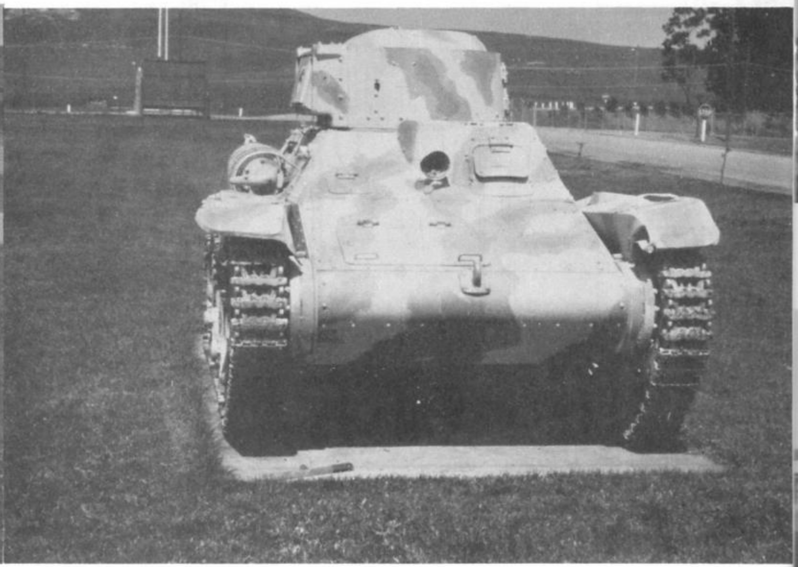
DRAWING BY Y.TOMIOKA.

ARMOR IN PICTURES

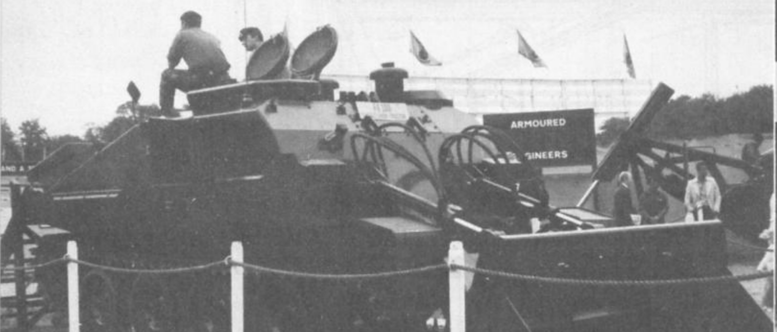
'Armor in Pictures' is a photographic-article series to display reader-submitted material on military vehicles and associated models or dioramas. Readers are invited to submit their photographs of vehicles or models for inclusion in this series. Photos should be packed securely, preferably between sheets of cardboard to prevent folding and/or damage, and sent to *AFV-G2*, P. O. Box 293, La Puente, CA 91747, Attn:'Armor in Pictures'. Credit will be given in the photo caption for all photos published and all photos will be returned after publication, along with a copy of the magazine in which the pictures appear.

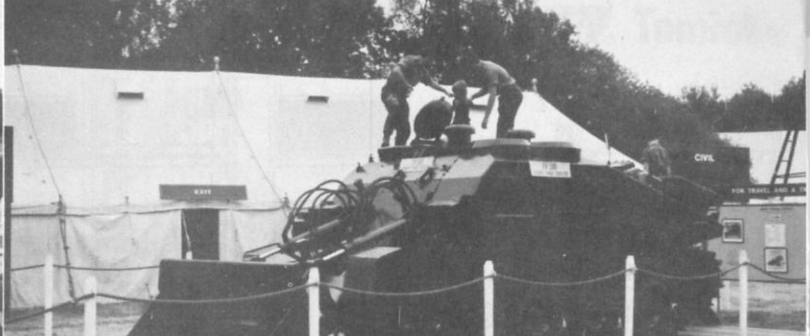
'Armor in Pictures' is also designed to serve readers as a forum for photo requests. If there's a particular photo reference needed, for modeling, for data. for accurate markings, etc., drop *AFV-G2* a note (at the above address) to let the staff know what is required. Our staff will attempt to provide the photos that the readers wish to see, and we'll also provide a list of requested photos that readers are searching for.



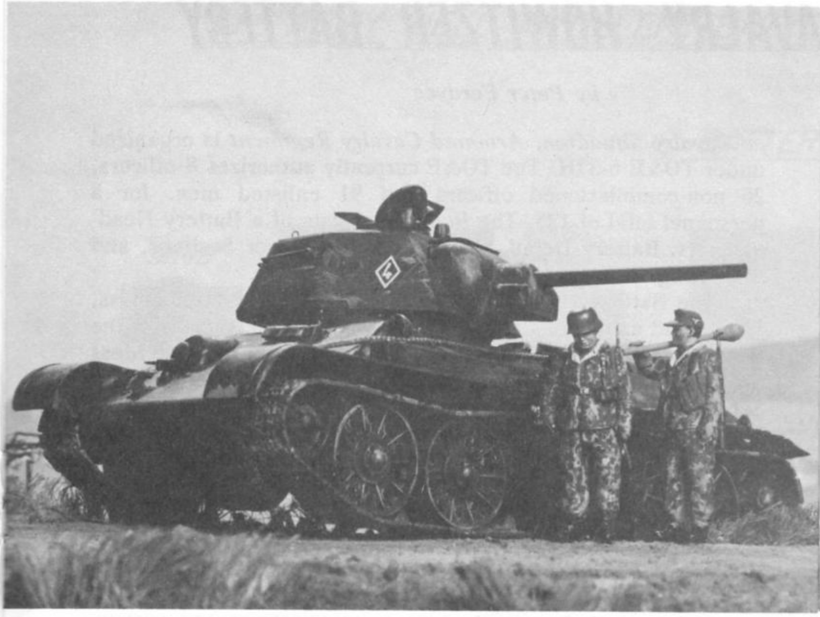


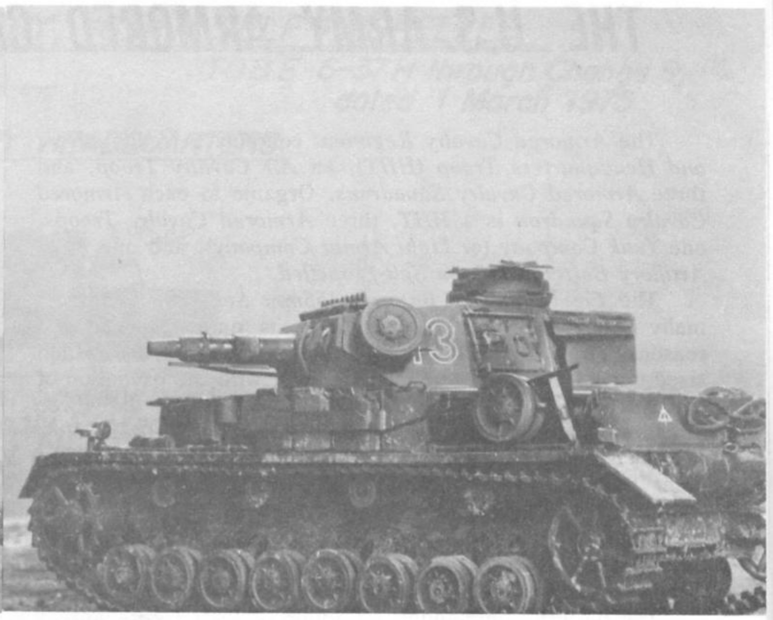
Above: Two photos of a Japanese Type 95 Light Tank on display near the main gate at Camp San Luis Obispo, California. The vehicle is painted in an overall light tan with two colors of green applied as camouflage. Note that the armament is missing but the rest of the vehicle is complete. These photos were supplied by Lt. Paul Schaden.



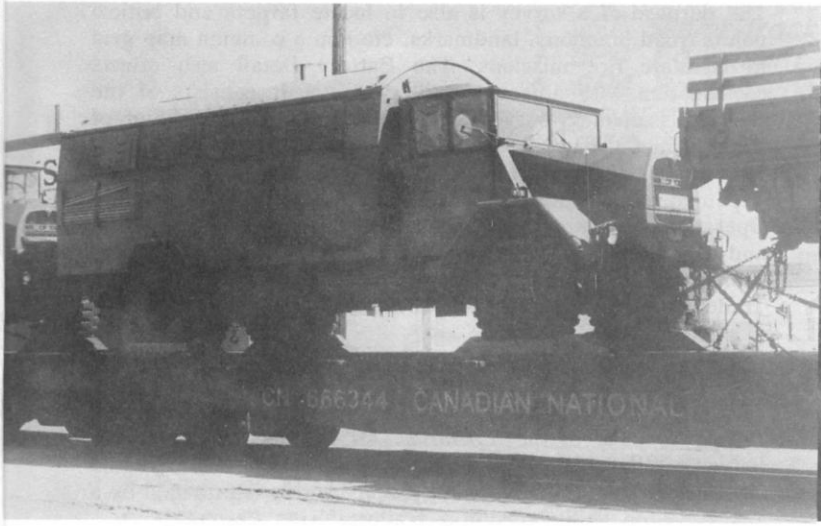


The two photos above were taken during a British Army Display held at Aldershot, England from June 26th to 28th of this year. They depict, for the first time at a public display, the *FV180* Combat Engineer Tractor, Prototype #5, one of a series of seven prototypes recently completed by the Royal Ordnance Factory, Elswick, Leeds, to a design by the Military Vehicle Engineering Establishment at Christchurch. The vehicle weighs 17.1 tons, being fully amphibious and propelled by two water jets, powered by a Rolls-Royce C6 T.F.R. six-cylinder diesel engine which develops 320 horsepower at 2100 r.p.m. The *FV180* has a two man crew and was designed to carry out all the tasks performed by the Engineer Pioneer Units (i.e. river crossing support for mechanized units, obstacle destruction, defensive position building, recovery, etc.). It is undergoing trials with the British Army with final approval for quantity production expected by the end of 1975. The above photos and the data were provided by W. A. R. Wright of London, England.

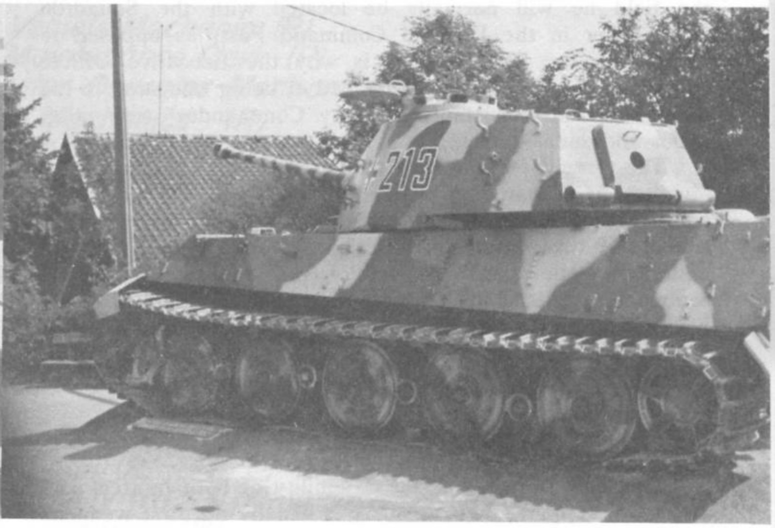




Above, Left: This photo from Dr. Koyu-Go, our correspondent in Japan, shows Tamiya's 1:35th scale Russian T-34/76 tank posed with two of Squadron's new 1:35th scale German figures, painted as *Waffen-SS* infantrymen. *Above, Right:* This photo, also by Dr. Koyu-Go, illustrates Italaerei's new German *Panzerkampfwagen IV., Ausf. F1* in 1:35th scale.

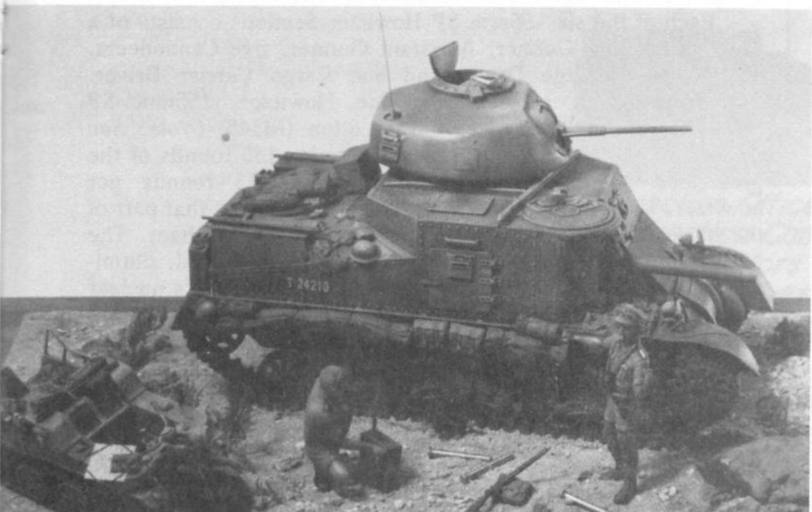


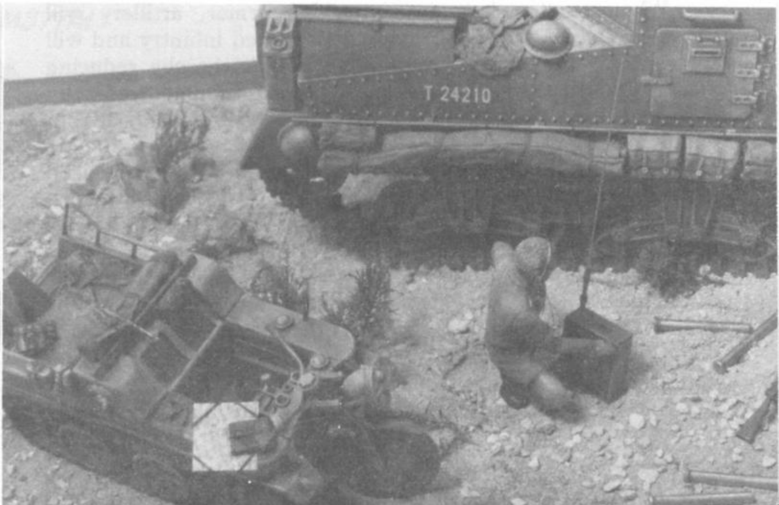
Above: This photo shows a West German ***Bundeswehr*** truck in the process of being shipped on a Canadian flatcar, somewhere in Arizona. This photo was provided by Larry Provo, who is interested in where this unusual shipment was bound to, as well as the reason why. Can any reader provide answers?



Above: This photo was supplied by Francois Verlinden and it shows the German Tiger II. heavy tank on display in La Gleise, Belgium. This vehicle marks the high-water point of the penetration of *Kampfgruppe Peiper* during the Ardennes Battle (the 'Battle of the Bulge') in the winter of 1944-45.

The photos below show two views of a 'Western Desert' diorama by Francois Verlinden. The vehicle are Tamiya and have been superdetailed, but it is the realistic painting and shading which turns the diorama into a work of art. Note the brass shell casings, the Enfield rifle and the extra details on the *Kettenkrad* (map case, map, *MP-40* and binoculars).





THE U.S. ARMY ARMORED CAVALRY HOWITZER BATTERY

by Peter Fordyce

The *Armored Cavalry Regiment* contains a *Headquarters and Headquarters Troop* (*HHT*), an *Air Cavalry Troop*, and three *Armored Cavalry Squadrons*. Organic to each *Armored Cavalry Squadron* is a *HHT*, three *Armored Cavalry Troops*, one *Tank Company* (or *Light Armor Company*), and one *Field Artillery Battery, 155mm Self-Propelled.*

The *Field Artillery Battery, 155mm Self-Propelled*, normally referred to as *'How Battery'*, is unique for several reasons. First, it is the only *FA Battery* organic to a battalion sized unit of a different service. Second, with the exception of the *HHT*'s, every *Troop/Company* in each of the three *Squadrons* is identified alphabetically (A through M). The *How Battery* is designated *'How 1'*, *'How 2'*, or *'How 3'*, dependent upon whether it's assigned to the first, second or third squadron.

The mission of the *How Battery* is to provide fire support to the *Armored Cavalry Squadron* and to furnish its portion of the target acquisition, communications and survey systems.

The Battery Commander, a Captain or First Lieutenant, is the Fire Support Coordinator (FSCOORD) for the *Armored Cavalry Squadron* and is the principal advisor to the Squadron Commander on fire support matters. For this reason, when in the field he will normally be located with the Squadron Commander in the Forward Command Post, as opposed to being with the Battery. This is why the Executive Officer commands the Firing Battery instead of being relegated to the normal role of 'Assistant Company Commander' with other major additional duties.

The three *How Batteries* of the Regiment cannot operate together as a battalion without a staff and the necessary additional personnel. When artillery is attached or placed in support of the regiment, the *How Batteries* may be placed under the operational control of the supporting artillery commander. This artillery officer then becomes the regimental FSCOORD, giving him the flexibility to deliver massed fires. When an *Armored Cavalry Squadron* is conducting an independent or semi-independent mission and is supported by a *FA Battalion*, the *How Battery* comes under operational control of the *FA Battalion*; the *FA Battalion* Commander becoming the *Squadron* FSCOORD.

The *How Battery* has the capability of both indirect and direct fire support. Field Artillery is usually the first weapons system to engage enemy armor because of the long range capability and its different types of ammunition. In the indirect fire role, artillery is effective against enemy armor. Improved conventional ammunition can be employed against enemy tanks in defensive positions or assembly areas with devastating results for both troops and vehicles. Concussion and fire will cause destruction to armored vehicles and equipment. Therefore, the more fires a commander is able to mass, the more effective the operation.

When employed against attacking armor, artillery will cause casualties to accompanying dismounted infantry and will force enemy tanks crewmen to 'button up', thereby reducing visibility and effectiveness. As mentioned, if employed with sufficient intensity, artillery can destroy tanks and disrupt enemy attack formations.

When in the direct fire role, individual howitzers are used to destroy hard targets such as bunkers. The 155mm howitzer, using Shell, HE with Fuze, Quick, is effective against armor because of the size and explosive power of the projectiles. First round fires are used to immobilize tanks and damage vehicular communications equipment. The immobilized tanks then can be destroyed by subsequent fire. This is the reason *How Battery* is placed well forward in formation to permit rapid entry into battle.

The *Field Artillery Battery, 155mm Self-Propelled, Armored Cavalry Squadron, Armored Cavalry Regiment* is organized under TO&E 6-37H. The TO&E currently authorizes 8 officers, 26 non-commissioned officers and 91 enlisted men, for a personnel total of 125. The *Battery* consists of a Battery Headquarters, Battery Detail, four Forward Observer Sections, and the Firing Battery.

The Battery Headquarters provides administration, mess, supply and motor maintenance for the *Battery*. It consists of the Battery Commander and his Driver, First Sergeant, Mess Sergeant and Cooks, Supply Sergeant and Unit Clerk, Motor Sergeant and Mechanics, plus an Armorer and an Equipment Maintenance Clerk. Transportation is provided by one Truck, ¼-ton Utility (M151A2), three Trucks, 2½-ton Cargo (M35A2), one Trailer, 1½-ton Cargo (M105A2), and one Trailer, 1½-ton Water, 400 Gal. (M149). This section provides two Track Vehicle Mechanics upon request to the Squadron Maintenance Section to assist in performing squadron-level maintenance on organic automotive equipment.

The Battery Detail provides reconnaissance and survey, and provides communications and commo maintenance for the *Battery*. This section is responsible for searching out and securing primary and alternate positions for the Firing Battery. The purpose of a survey is also to locate targets and critical points (road junctions, landmarks, etc.) on a common map grid to facilitate fire missions. The Battery Detail also effects coordination with adjacent artillery units. It consists of the Reconnaissance & Survey Officer with his Driver, Chief of Detail, Chief of Party, two Survey Computers, Survey Recorder, Instrument Operator, FADAC Mechanic, and two Rodmen-Tapemen. A Communications Chief, Senior Tactical Wire Operations Specialist, two Tactical Wire Operations Specialists and a Senior Field Switchboard Operator fill out the section. Transportation is provided by one Truck, ¼-ton Utility towing a Trailer, ¼-ton Cargo (M416), and two Trucks, 1¼-ton Cargo (M561 Gamma Goat).

The *Battery* has four Forward Observer Sections; each FO Section locates targets, adjusts fire and reports intelligence information. One FO Section is attached to each committed *Troop/Company* of the *Squadron*. An FO Section contains a Forward Observer, Reconnaissance Sergeant and a Radio Operator-Driver. Each Section's transportation is provided by a Truck, ¼-ton Utility towing a Trailer, ¼-ton Cargo.

The Firing Battery consists of a Firing Battery Headquarters, six Howitzer Sections and an Ammunition Section.

The Firing Battery Headquarters consists of the Executive Officer (FB Commander), Chief of Firing Battery, two FA Turret Artillery Mechanics and one FA Recorder-Driver. A Fire Direction Officer, two Fire Direction Computers, two Chart Operators and a Command Post Carrier Driver complete the section. Transportation is provided by one Truck, 1¼-ton Cargo and one Carrier, Command Post (M577A1).

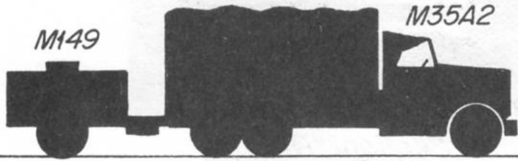
Each of the six 155mm SP Howitzer Sections consists of a Chief of Section, Gunner, Assistant Gunner, five Cannoneers, one Motor Carriage Driver and one Cargo Carrier Driver. Transportation is provided by one Howitzer, 155mm SP (M109A1) and one Carrier, Cargo, 6-ton (M548) (*Note: See AFV-G2, Vol.4, No.3*). Each howitzer carries 150 rounds of the prescribed basic load of ammunition of 275 rounds per howitzer. The Cargo Carrier is provided to transport that part of the basic load which cannot be carried on the howitzer. The M109A1 is capable of firing high-explosive, chemical, illumination, smoke, and nuclear ammunition. The howitzer's nuclear capability rendered the *Squadron* Davy Crockett Section obsolete. The additional capability to safeguard nuclear materials, when employed, is provided by the attachment of an appropriate number of *FA Security Teams- Cannon* from TO&E 6-500.

Continued on Page 40

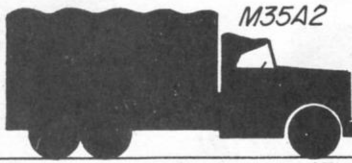
U.S. ARMY FIELD ARTILLERY BATTERY, 155mm SELF-PROPELLED

TO&E 6-37H through Change 9,
dated 1 March 1975

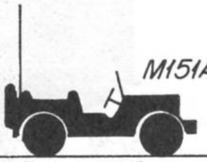
BATTERY HEADQUARTERS



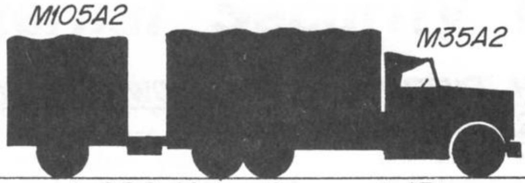
1 SFC Mess Sergeant (R)
1 SP6 First Cook (R)
2 SP5 Cook (R)
1 SP4 Cook-Driver (R)



1 1SG First Sergeant (R)
1 SSG Supply Sergeant (R)
1 SP5 Unit Clerk (R)
1 SP4 Armorer-Driver (R)(GL)

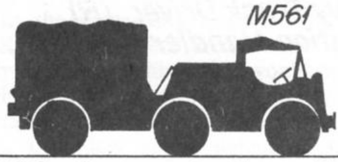


1 CPT Battery Commander (P)
1 PFC Driver (R)

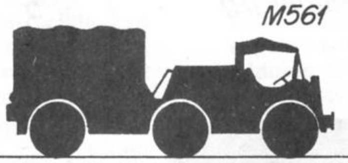


1 SSG Motor Sergeant (R)
1 SGT Senior Track Vehicle Mechanic (R)
1 SP4 Equipment Maintenance Clerk (R)
1 SP4 Power Generator Operator-Mechanic (R)
2 SP4 Track Vehicle Mechanics (R)
1 PFC Asst. Track Vehicle Mechanic (R)
1 PFC Asst. Track Vehicle Mech.-Driver (R)(GL)

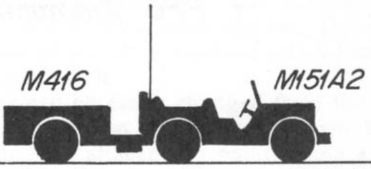
BATTERY DETAIL



1 SSG Communications Chief (R)
1 SP4 Sr. Field Swbd. Oper. (R)
1 SP4 Sr. Tac. Wire Specialst (R)
2 PFC Tac. Wire Specialists (R)
1 PFC Rodman-Tapeman-Driver (R)(GL)

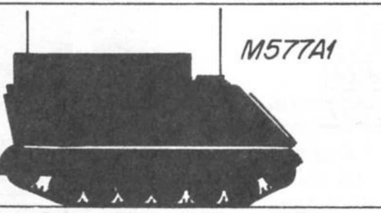


1 SFC Chief of Detail (R)
1 SSG Chief of Party (R)
2 SP5 Survey Computers (R)
1 SP4 Instrument Oper. (R)
1 SP4 Survey Recorder (R)
1 SP4 FADAC Mechanic (R)
1 PFC Rodman-Tapeman-Driver (R)(GL)

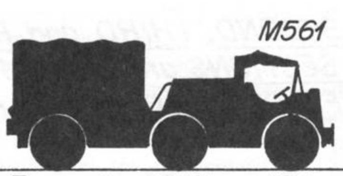


1 LT Recon-Survey Off. (R)
1 PFC Driver (R)(GL)

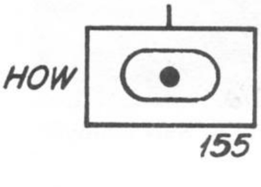
FIRING BATTERY HEADQUARTERS



1 LT Fire Direction Officer (R)
2 SP5 Fire Direction Computers (R)
2 SP4 Chart Operators (R)
1 SP4 CP Carrier Driver (R)



1 LT Executive Officer (R)
1 SFC Chief of Firing Battery (R)
2 SP4 FA Turret Arty. Mechanics (R)
1 SP4 FA Recorder-Driver (R)



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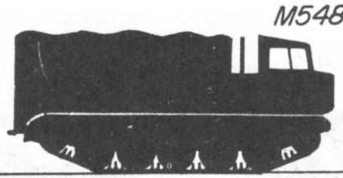
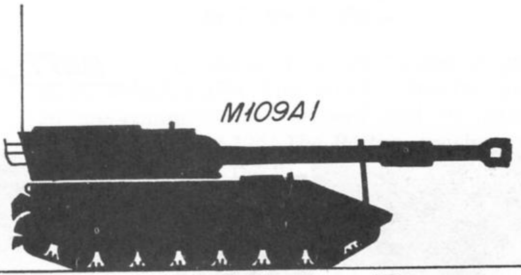
FIRING BATTERY - FIRST HOWITZER SECTION



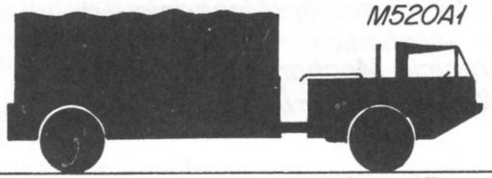
1 SP4 Cargo Carrier Driver (R)
1 PFC Cannoneer (R)



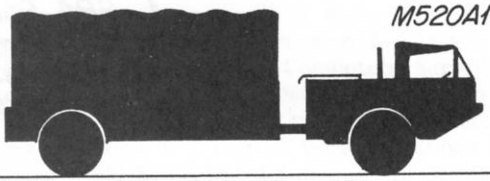
1 SSG Chief of Section (R)
1 SGT Gunner (R)
1 SP4 Assistant Gunner (R)
4 PFC Cannoneers (R)
1 SP4 Driver (R)

SECOND, THIRD, FOURTH, FIFTH and SIXTH HOWITZER SECTIONS are identical to the FIRST SECTION shown above.

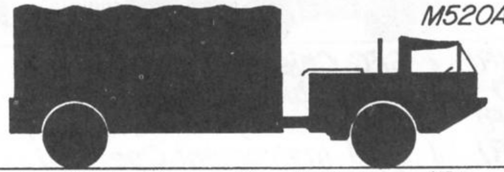
AMMUNITION SECTION



1 SP4 Heavy Truck Driver (R)
1 PFC Ammunition Handler (R)



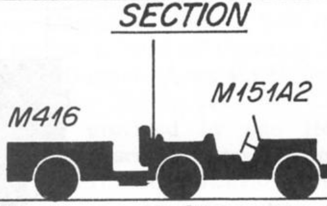
1 SSG Chief of Section (R)
1 SP5 Sr. Heavy Truck Driver (R)
1 PFC Ammunition Handler (R)



1 SP4 Heavy Truck Driver (R)
1 PFC Ammunition Handler (R)

FIRST FORWARD OBSERVER SECTION

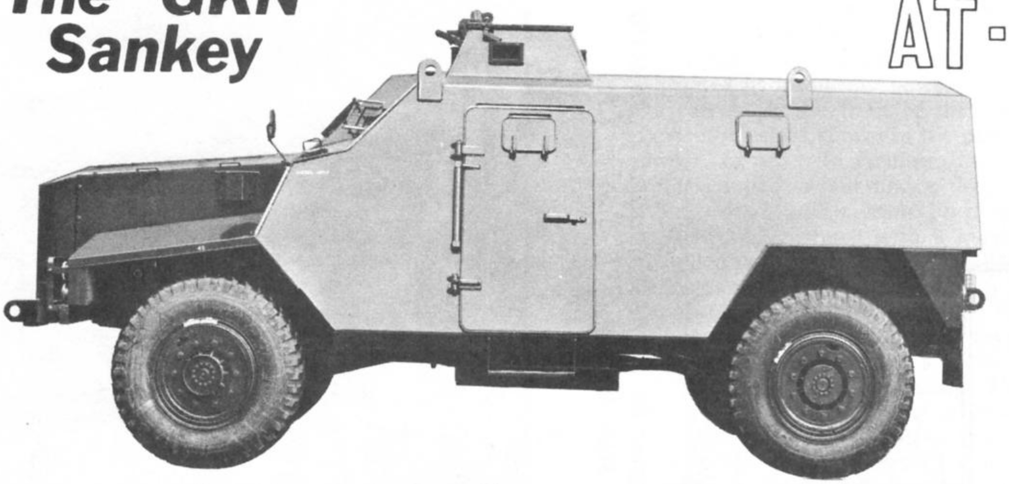
SECOND, THIRD and FOURTH FO SECTIONS are identical to the FIRST FO SECTION shown at right.



1 LT Forward Observer (R)
1 SGT Reconnaissance Sgt. (R)
1 PFC Radio Operator-Driver (R)

NOTE: This unit is 80% mobile in organic vehicles and 100% transportable in heavy transport aircraft.

The GKN Sankey AT-104

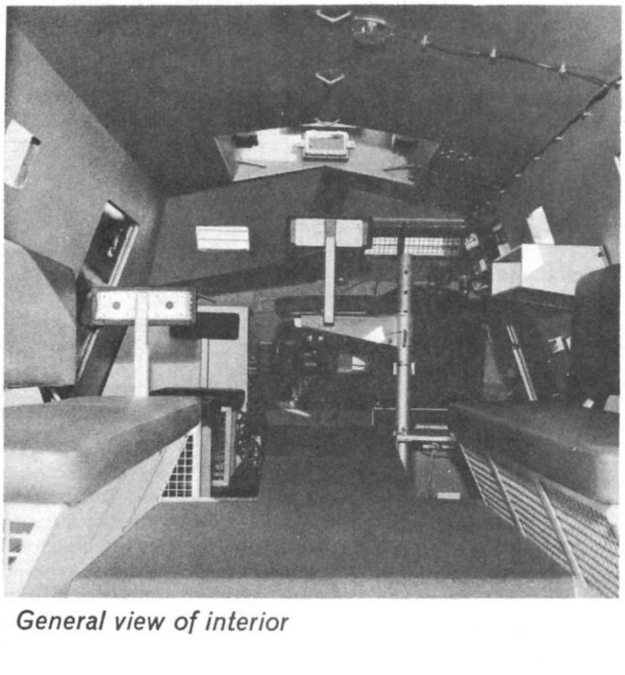


Internal Security Vehicle

The **AT-104** is a 4-wheel drive Internal Security Vehicle capable of transporting up to 11 men and their equipment. It has been developed by GKN Sankey Ltd., one of Britain's leading designers and producers of military vehicles and support equipment. GKN Sankey is a major sub-group of Guest, Keen and Nettlefords Ltd., one of Britain's largest engineering group with world-wide interests.

The design concept for the **AT-104** called for an armored vehicle particularly suited for internal security duties, competitively priced and easy to maintain. The steel armor is thicker than most competitive vehicles and provides protection against high velocity small arms fire at close range. The vehicle is fast and maneuverable in urban areas and can handle off-road situations, including sand when fitted with special tires. In its standard form, the **AT-104** has no vehicle-mounted armament, but the cupola can be replaced in manufacture with a specially designed turret to mount various weapons systems.

With the increasing incidence of urban insurrection and riot, GKN Sankey recognized that there was a need for a specially designed vehicle that would provide protection against high velocity small arms fire, which has figured increasingly in close-quarter urban terrorist activity (such as in Northern Ireland). Ultra-low speed selection on 4-wheel drive allows unditching and traverse of difficult terrain in off-highway situations. With special tires, this capability includes traverse of sand. Top speed is about 50 m.p.h. (80 km/hr) with 30 m.p.h. (48 km/hr) possible for 60 miles (96 km) when the 'Run-Flat' tires are shot through.



General view of interior

The vehicular hull is a monocoque, electrically welded unit fabricated from rolled steel armor plate. Fuel, engine, batteries and essential brake gear are all contained within the armored envelope. Roof, floor plates and doors are all fully armored and floor plates are sloped to provide protection against the blast effects of small mines. Doors and hatches are fitted with counter-balance springs and the air intake for the radiator has armored louvres. For quick deployment and protection under fire, wide double doors are provided at the rear (a feature not offered in most competitive vehicles) and there is a single door at the side, in addition to the driver's door. A command cupola with opening top provides all-round vision. Alternatively, the cupola can be replaced with a specially-designed turret mounting various weapons systems.

The driver's position is fitted with three bullet-proof glass block windows protected by wire mesh screens. The command cupola has bullet-proof observation windows on all four sides in addition to an opening hatch.

All vision blocks can be easily changed from the inside of the vehicle. Screen wipers on the driver's vision block are designed to clear windows attacked by paint, using a specially designed washer fluid.

The vehicle is fully-equipped with hinged ports protected by splash strips to facilitate observation or the use of personal weapons. These are positioned with two ports per side, two ports in the rear door and one port in the front below the armored cupola. Sealed ball mounts with vision blocks can be mounted in the ports as an extra feature so that the crew can be fully protected when using personal weapons.

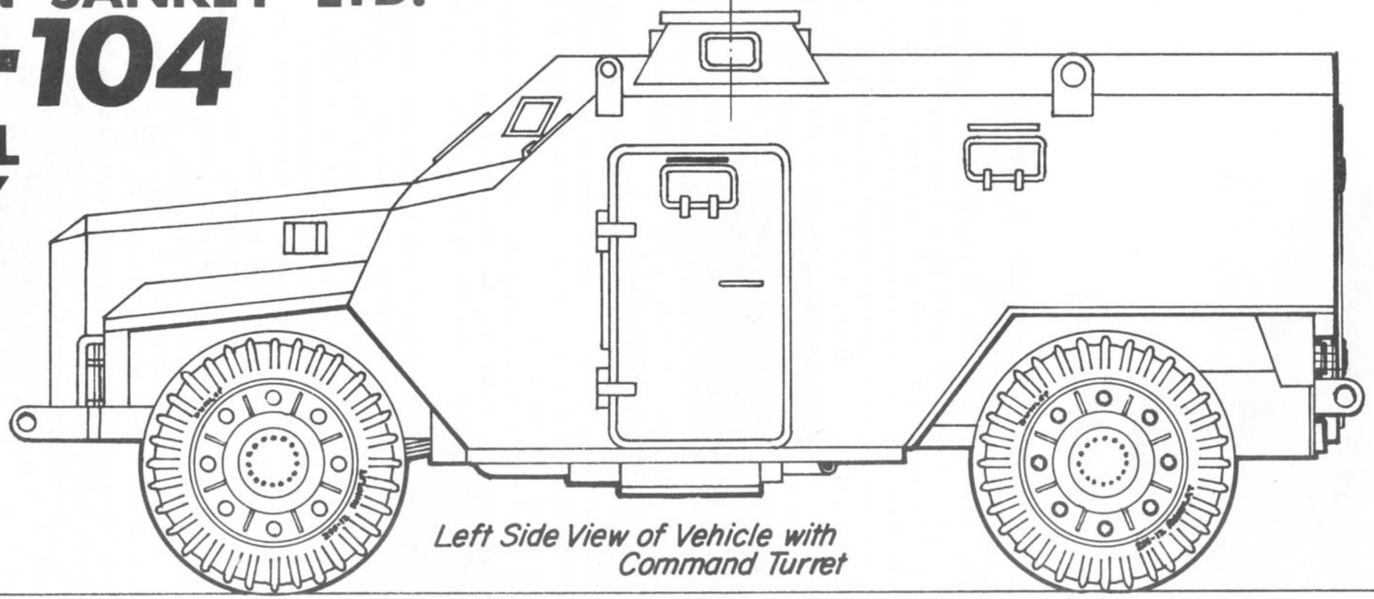
In terms of automotive components, the **AT-104** is designed to utilize standard production line components, thus ensuring world-wide availability of spare parts and service. A number of gasoline or diesel power units can be fitted to provide a power range of 100 to 150 b.h.p. The standard vehicle uses well-tested and proven power units from General Motors.

An automatic transmission is fitted since it requires less driver skill than a manual gearbox. It reduces the possibility of error and consequent component damage in tense situations. The unit fitted is a General Motors Allison AT540 transmission which has four speeds forward, one speed reverse, planetary gear train and a three-element torque converter. There is a mounting provided for power take-off.

Vehicles may be supplied with left of right hand drive as required by the purchaser; the accompanying 1:32nd scale drawings show right hand drive. Power assisted steering is provided as standard unless other specified.

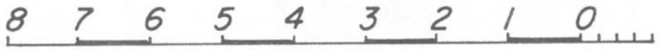
Running gear components are all standard production line items from the Bedford Division of General Motors and are designed for the tough, world-famous MK series truck.

THE GKN SANKEY LTD.
AT-104
INTERNAL SECURITY VEHICLE



Left Side View of Vehicle with Command Turret

Drawn by James Steuard from data supplied by GKN Sankey Ltd.



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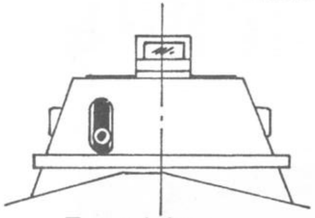
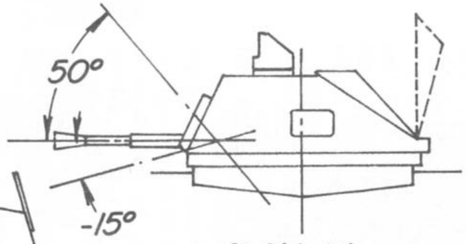
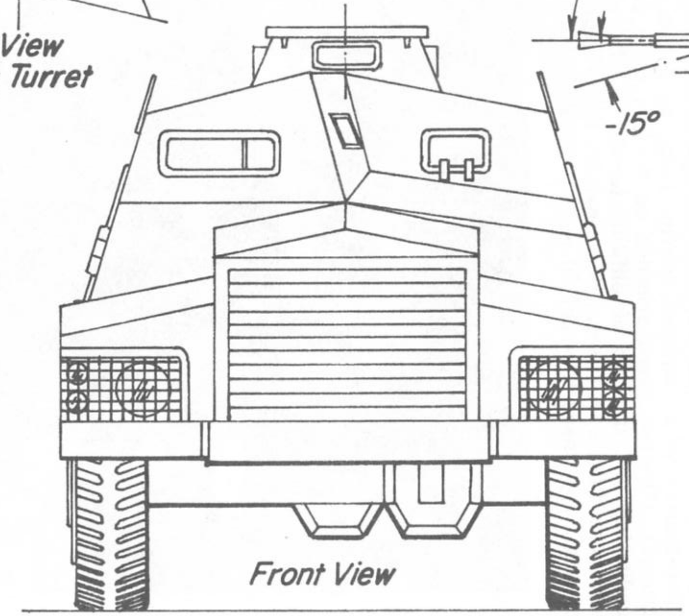


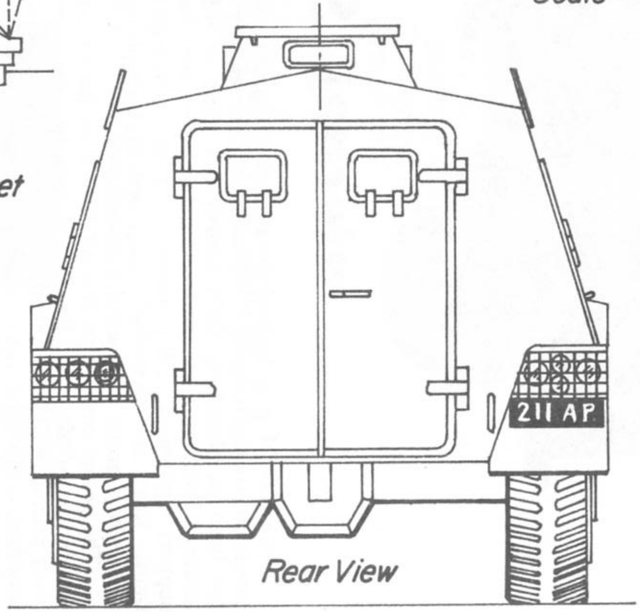
Front View Weapons Turret



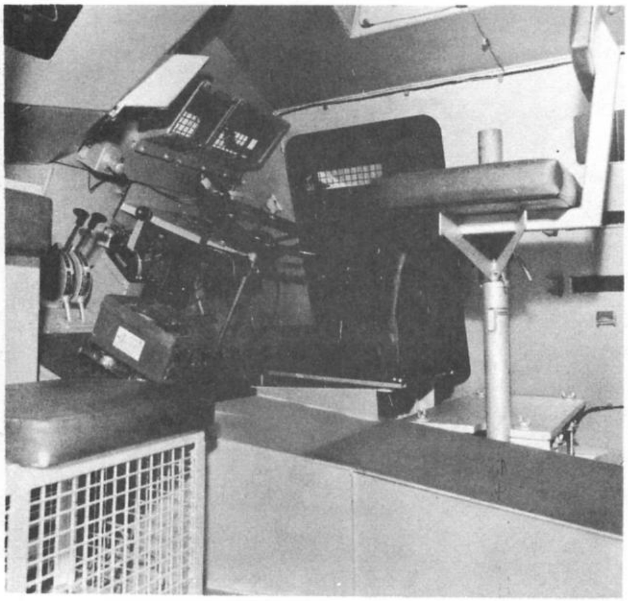
Left Side View Weapons Turret



Front View



Rear View



Driver and Commander positions

Dual-circuit hydraulic system brakes with servo assistance are provided, operating on normal drum brakes. A separate hand-operated parking brake operates on the pinion shaft of the rear axle. Wherever possible, brake parts and hydraulic tubing are within the armored body envelope.

The **AT-104** is equipped with 12.00x20 'Run-Flat' non-directional, cross-country tires with tubes, fitted on standard B8.0x20 three-piece wheels. Bead locks are provided to prevent the tires moving on the rims when running in a deflated state. With this equipment, the **AT-104** can proceed with its mission even when the tires are in a shot-through condition. Normally, no spare tire or wheel is carried.

The vehicular electrical system is 24 volt, with a battery capacity of 100 amp/hr., charged by an engine-driven alternator with a 790 watt output. All components are screened to permit the use of normal communications systems. Provision is made for the fitting of many standard radio sets. Sufficient power is available for crowd-control loud-speaker systems which may be mounted on the vehicle. An auxiliary power plant can be fitted for silent watch duties or to provide power for high output electrical devices.

There are a number of optional accessories which may be supplied to purchasers. As previosuly stated, the commander's cupola may be replaced by a hand-traversed turret which mounts single or twin machine guns of 7.62mm or 5.56mm caliber. It incorporates a rear hatch which opens to provide head protection for the 'sitting out' position. The gunsight is a periscope with a ring and dot graticule. Two armored glass vision blocks are fitted in the forward section. A fume extractor is fitted, and a searchlight can be mounted on the right side of the turret, linked to the gun elevating mechanism. The turret has a maximum elevation of 50°, a maximum depression of -15° and a traverse of 360°. An adjustable gunner's seat is fitted.

If the turret is not fitted, facilities can be provided for mounting a machine gun for firing from the open cupola hatch.

Smoke or riot gas grenade dischargers can be fitted either to the turret or to the hull of the **AT-104**. These are discharged electronically from inside the vehicle. There are two versions: Fitted to turret - 8 tubes for 66mm grenades, giving 180° coverage. Fitted to hull - 4 tubes for 66mm grenades giving 360° coverage by hand control.

There are two air conditioning options, a full air conditioning pack or a ventilating fan only. In both cases, the design would facilitate either the drawing-in of fresh air, or the circulation of internal air when in a riot gas environment. A heater can be provided to insure for the comfort of the crew.

Searchlights can be fitted to the vehicle roof, proving an illumination range of 950 yards (870 meters). Glass can be provided with protective wire mesh. In another option, flashing beacons and siren can be mounted, in addition to a loud-speaker system.

Another option which has a good potential is a specially designed hydraulically powered barricade remover, which can be carried at the front of the vehicle. The operation of this device, which is shown in the photo below, is controlled by the driver, in order to facilitate the removal of objects from the vehicle's path when under fire. This barricade remover has lifting forks, plus a crane jib if required.

A hydraulic winch with a maximum pull of 5-tons can be installed to the front of the **AT-104** (unless a barricade remover is installed). Power for the winch is obtained from a hydraulic pump driven by a take-off from the automatic transmission.

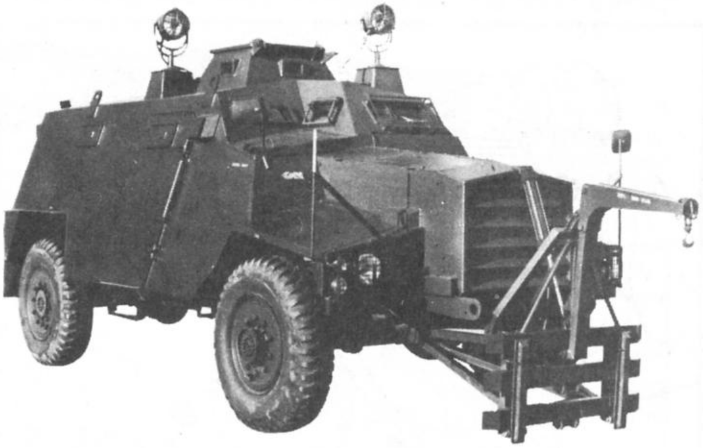
A rear door safety lock can be provided on this vehicle; this door lock is operated from a control by the driver's seat instead of the standard outside fitting. The installation of this safety lock prevents the entrance of unauthorized persons.

If desired, a higher degree of radio interference suppression can be incorporated into the vehicle if the customer's required radio frequency band and maximum signal-to-noise ratio are known. This type of suppression can be provided for battlefield surveillance radar systems.

Special seating arrangements can be considered for **AT-104** vehicles in order to provide for special customer requirements, or to enable the **AT-104** to function as a Command Post vehicle, with folding map tables, etc.

Some of the wide variety of operations in which the **AT-104** can be utilized include deployment of internal security forces for the control of public disorder. The vehicle can be used as a reconnaissance vehicle, and armored personnel carrier, a convoy escort vehicle, or as a command post or communications vehicle. Another feasible role would be as an armored transport for the movement of money and other valuable property. The vehicle can be used by military police forces as a patrol vehicle for airfields, military installations and other high security risk areas. As a back-up vehicle for regular military units, the **AT-104** can serve as an armored ambulance or as an armored breakdown and recovery vehicle.

It is clear that the **AT-104** offers a number of advantages over military armored cars, which often are over-armored and have a lack of carrying capacity. One of the biggest advantages offered by such a design as the **AT-104** is in terms of cost; the **AT-104** is available at a fraction of the cost of a purely military armored car, which, up to this time, has been the only available solution to internal security problems. Whatever the reasons for acquiring this type of equipment, there are several nations which are obviously interested in GKN Sankey's new products. Reports are that Brunei has purchased a number of **AT-104**'s and other orders are now pending construction and shipment.



Above: An angled front view of an **AT-104** showing the optional barricade removing device. Note the fitting of fender mirrors which permit accurate placement of the barricade remover in action. The twin roof searchlights are also an optional fitting. Note that the vehicle shown is a left hand drive version.

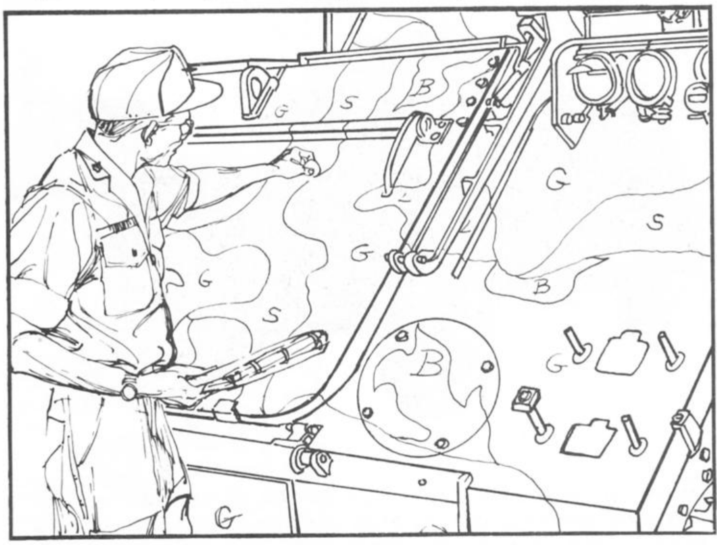
COLOR 'N CAMOUFLAGE:

Modern U.S. Army 4-Color Camouflage

by Gary Binder

For all armored enthusiasts who are interested in AFV coloration and camouflage, and especially those who have considered U.S. Army vehicles too plain, it will come as pleasant news to learn that semi-gloss Olive Drab is to become a thing of the past. After considerable testing by the Modern Army Selected Systems Test, Evaluation and Review Board (MASSTER for short), the Department of the Army recently approved a plan to put all tactical and combat vehicles into a four-color disruptive camouflage.

The precedents for camouflage painting of vehicles in the U.S. Army date back to the First World War, when the American forces received vehicles painted in the standard French or British colors in use at that time. From World War II. until the present, camouflage painting was left up to the individual unit or crew. No programs were initiated from above Army Headquarters, although the Armored Section of the 12th Army Group Staff reported to the War Department that disruptive painting of tanks at the factory would be desireable. Due to the wide variety of areas that the U.S. Army has operated in, no previous steps were undertaken to centralize policy beyond the recommendations and principles laid down in field manuals.



Above: Soldier applying a camouflage pattern with chalk. Note that the abbreviation for the color is marked in each pattern area. Credit: U.S. Army

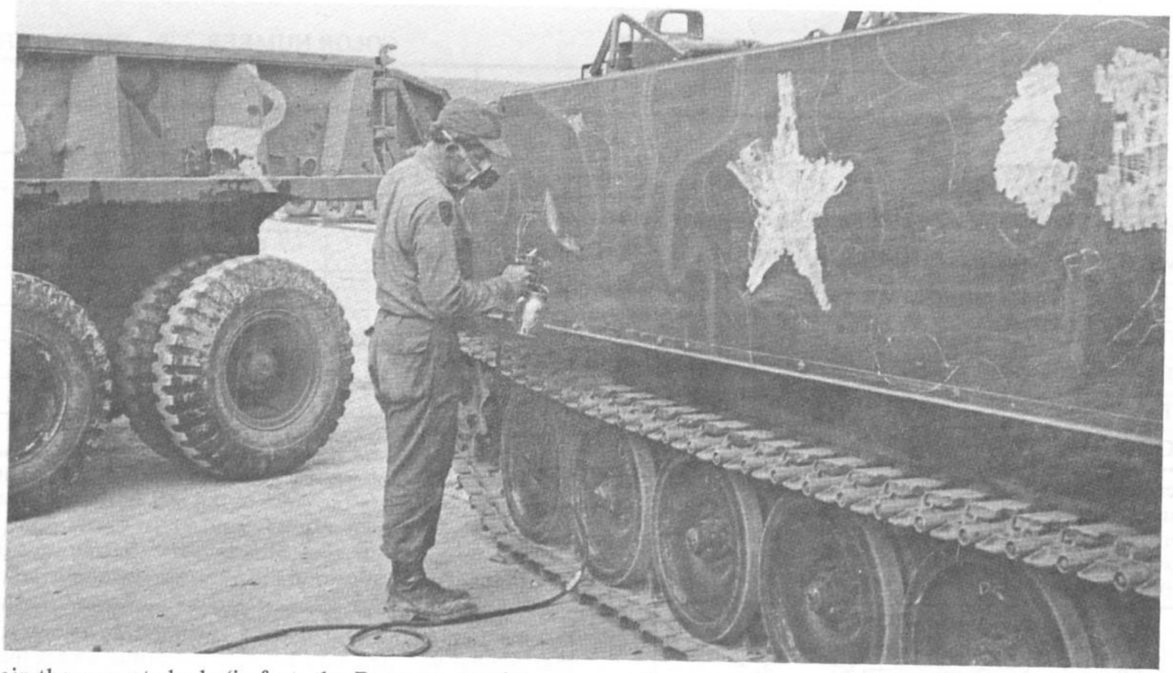
Pattern painting was not popular among the troops and it was not often engaged in. Many notable exceptions to this have already been pointed out by various authors in many magazine articles and books, however, for the most part, U.S. Army vehicles have gone to war in Olive Drab with white stars as recognition markings.

About 1972, camouflage tests were initiated by MASSTER at the request of General Bruce Palmer. The initial unit involved was the *2nd Brigade* of the *2nd Armored Division*, although eventually the entire division was also put into the act. Patterns and techniques for painting were worked out by the Army's Mobility Equipment Research and Development Center (MERDC), based at Fort Belvoir, Virginia. Various colors and methods of camouflage underwent experimentation and recommendations were issued that new tanks were to be pattern painted on the production line. After the testing and evaluation, the Army adopted a revised program for painting of vehicles and equipment in March of 1974.

All new major items of equipment are to be painted lusterless Forest Green at the depot or factory, with the three other colors being added to complete the pattern at the unit level, using troop labor. One of the important findings of the MASSTER tests was that it is not necessary to hire special technicians for camouflage painting, just issue the troopers a pattern, let them sketch it on the vehicle, and do the painting themselves. Vehicles and items of equipment already issued are to be given an overall coat of lusterless enamel and then pattern painted at the unit level.

A pattern has been prepared for almost every vehicle in the Army inventory (and these are published in two spiral bound volumes by MERDC), and there are eight possible combinations of colors to use with these patterns, based upon the area and climate where the vehicle is operating. See the tables below for a list of the twelve colors of lusterless alkyd enamel that have been approved for camouflage use, as well as a chart of standard color combinations.

The theory behind this design for pattern painting is to provide a system that will readily adapt to changes in season, climate, or terrain, by changing one, or at the most two colors. As an example, Forest Green can be changed to Sand for desert operations, or Field Drab could be switched to White for winter operations, and so on. The twelve colors which are to be used are standard paints and do not require mixing or tinting in



Above: Soldiers outlining the pattern in the color to be painted. This method provides a boundary and controls the painting within its limits. The bare metal areas will receive a spray coat of primer paint before the color is applied. Credit: U.S. Army

order to obtain the correct shade (in fact, the Department of the Army has ordered that this not be done).

The camouflage pattern itself consists of wavy, irregular patches of color applied to the vehicle to break up its outline and make the vehicle less conspicious in its surroundings. The pattern sheets for each vehicle are available from the local Training Aids Service Office. The troops chalk the design onto the prepared surface of the vehicle, and then spray in the colors in a paint-by-number fashion. The borders of the patches of color can vary as much as two inches from the pattern without losing their effectiveness. DA recommends spray painting, except that the small black areas should be hand brushed until the troops gain more experience with spray paint equipment. The patterns not only break up the vehicles' outline in the field, but present a good military appearance in garrison. Pattern painted vehicles can be touched up with less color mismatches that is possible with a solid colored vehicle.

When first painted, the equipment is to carry the colors appropriate to the climate and terrain at the time. Repainting of vehicles to adapt to different conditions is to be done at the discretion of the unit commander.

Implementation of this new camouflage painting program is to commence in early 1975 for high priority units and later in the year, as supplies become available, for the rest of the Army. Two years is the estimated time needed for completion of this program by the Regular Army. The National Guard will commence painting in fiscal year 1976, and it is estimated that the reserve components will need four years to come into line with the new regulations. Army Reserve and National Guard equipment will be painted at an appropriate maintainence facility in accordance with the current maintenance program.

Items to be camouflaged in this program are tactical vehicles and trailers, combat vehicles, field artillery and air-defense weapons, engineer combat and construction equipment. Certain smaller items will be painted a single lusterless color at the unit level; this includes pioneer tools (and OVE) when carried on the outside of a vehicle, water and fuel containers, tactical generators, small air compressors, shipping containers, etc.

Initially, Army aircraft were not included in the repainting program, however, several attack helicopters were camouflaged for the MASSTER tests at Fort Hood, Texas, and the two volume set of camouflage patterns includes helicopters.

Markings on camouflaged vehicles will consist of the unit identification codes, painted in flat black in the usual size and place. The white star will be abolished as a recognition marking for combat vehicles; instead there will be a three-inch star in flat black centered on the front and rear of the vehicle, on a line with the unit ID markings. On wheeled vehicles, the black star may be placed on the tailgate. The standard 'U.S. Army' followed by a registration number will no longer be painted on the exterior of the vehicle, but instead will be placed on a data plate or some other suitable interior location. Some vehicles at Fort Hood and elsewhere have their registration numbers painted in black in the usual locations, so there will be photographs to show this.

Markings concerning tire pressure, fuel type, etc., can be retained, painted on the vehicle in flat black one-inch letters. Safety markings such as boom capacity and safety zone markings are to be evaluated by safety personnel. There has been no word on changing or deleting of the bridge classification disc on the front of the vehicle.

The Seventh Army in Europe began a four-color pattern painting program of its own about two-years prior to the adoption of this Army-wide program. The European colors and patterns are slightly different from those specified in the March 1974 DA directive; being evolved for European use, the Seventh Army patterns do not allow for variation in colors to match different areas of the world and different climates. As new equipment arrives in Europe, it is to be painted in accordance with the new MERDC patterns.

As well as pattern painting, MASSTER looked into the use of nets and natural camouflage materials. It was discovered that, due to the 150-pound weight of the U.S. Army burlap net, troopers were reluctant to break out the net to camouflage anything. The nets also presented stowage problems on combat

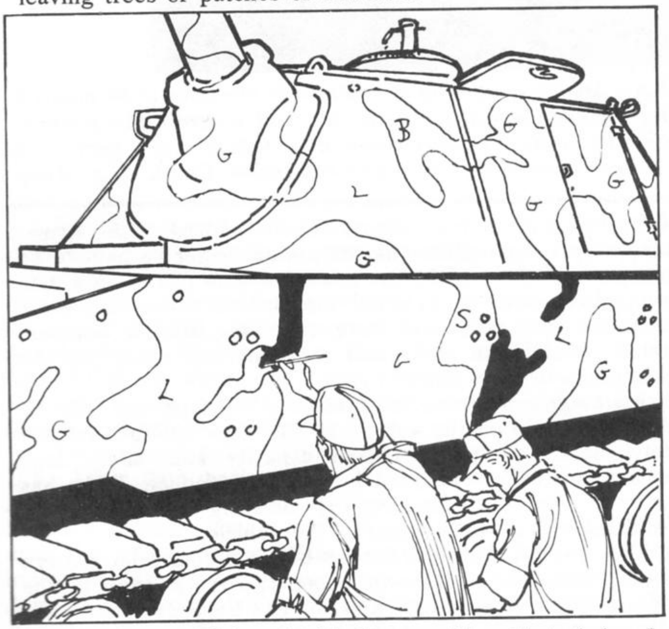
COLOR ABBREVIATIONS

COLOR	ABBREVIATION
White	W
Desert Sand	DS
Sand	S
Earth Yellow	EY
Earth Red	ER
Field Drab	FD
Earth Brown	EB
Olive Drab	OD
Light Green	LG
Dark Green	DG
Forest Green	FG
Black	B

CAMOUFLAGE COLOR SCHEMES	COLOR NUMBER & DISTRIBUTION			
	1	2	3	
	45%	45%	5%	5%
WINTER U.S. & EUROPE - VERDANT *	FG	FD	S***	BL
SNOW - TEMPERATE WITH TREES & SHRUBS **	FG	W	S***	BL
SNOW - TEMPERATE WITH OPEN TERRAIN **	W	FD	S***	BL
SUMMER U.S. & EUROPE - VERDANT *	FG	LG	S***	BL
TROPICS - VERDANT	FG	DG	LG***	BL
GRAY DESERT	S	FD	EY***	BL
RED DESERT	ER	EY	S***	BL
WINTER ARCTIC	W	W	W	W

Notes: * Verdant means generally green - in summer due to trees, shrubs and grass; in winter due to evergreens.
** This color combination is for use in areas that occasionally have snow which does not completely cover the terrain, thus leaving trees or patches of soil bare.

*** This 5% color should be the camouflage color that matches most closely the color of the soil in the local area. A typical color for such use is Sand, but Earth Red, Earth Yellow, or one of the others may be closer to the predominant soil color and, in that case, should be used.



Above: Soldiers applying the black area with a ½-inch brush. When greater skill is gained with spray paint equipment, most units will spray paint this area. Credit: U.S. Army

vehicles. In response to this problem, the Army has developed a new line of 'Camouflage Screens'. These new screens, tested at Aberdeen Proving Ground, have new lightweight cords and polyester netting in hexagon and diamond patterns; also involved are new lightweight spreader assemblies and fiberglass poles. One of the more important aspects of the new screens being tested is the inclusion of a 'radar scattering' material in the nets which is supposed to prevent enemy surveillance aircraft from 'seeing through' the screens. There are three types of these screens, the woodlands (or tropical) model, the desert model, and the arctic model. Reportedly, the Devil's Lake Indian Tribe will be one of the contractors for the new screens.

Due to the problems associated with the old style nets, MASSTER recommended that clips and brackets be added to vehicles for the attachment of foliage, but no action has been taken on this idea to date.

Pattern painting with lusterless paints reduce the highlights of a vehicle, distorts its geometric lines, and reduces the contrast between a vehicle and its surroundings. Pattern painting also makes further camouflage with foliage or nets more effective and easier.

The need for pattern painting and other methods of disguise and concealment have assumed new importance now that combat vehicles have become the prime target for a host of ground and air-launched, optically tracked guided missiles. Another factor to be considered in the adoption of the new camouflage pattern is that NATO forces are no longer guaranteed of total air supremacy.

All-in-all, the new painting program will be most interesting to historians and modelers alike, and it seems that few tears will be shed for the passing of the 'Olive Drab Era'.

WINTER U.S. & EUROPE - VERDANT COLOR SCHEME

FOREST GREEN 34079
40 pts Floquil M46 Dark Green
14 pts Floquil RR30 Reefer Orange
5 pts Floquil RR10 Engine Black
2 pts Floquil RR20 Caboose Red

FIELD DRAB 30118
12 pts Floquil RR81 Earth
3 pts Floquil RR30 Reefer Orange
1 pt Floquil RR10 Engine Black

SAND 30277
24 pts Floquil M75 Buff
4 pts Floquil RR11 Reefer White
2 pts Floquil RR31 Reefer Yellow
1 pt Floquil RR10 Engine Black

BLACK 37038 - Use Floquil RR10 Engine Black

Notes: In compiling this article, 'Camouflage Pattern Painting' TC 5-200 (Test Edition), September 1974 provided much of the detailed information as well as the photos and drawings in the article. Other sources were:

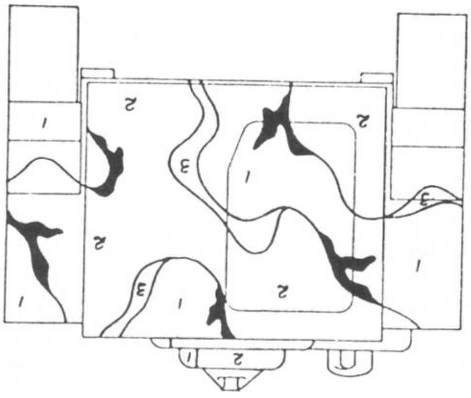
Armor Magazine, July-August 1973, *'MASSTER Briefing'*, by Colonel Charles Canedy, pp. 37-39

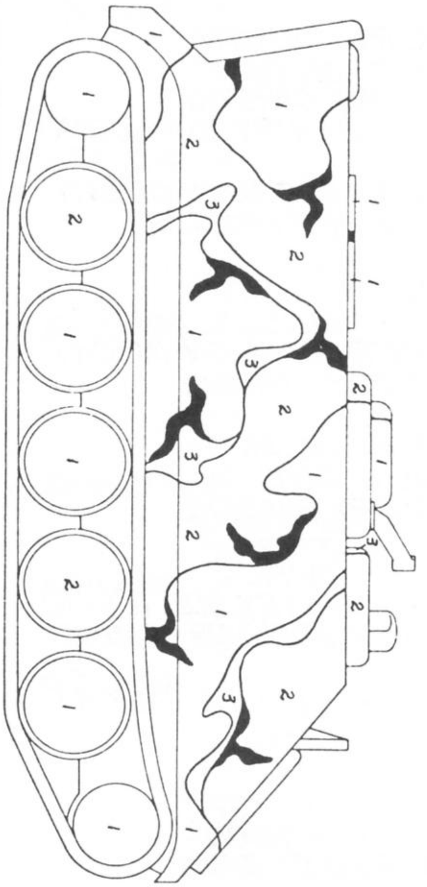
National Guardsman Magazine, October 1974, pp. 19 and 23

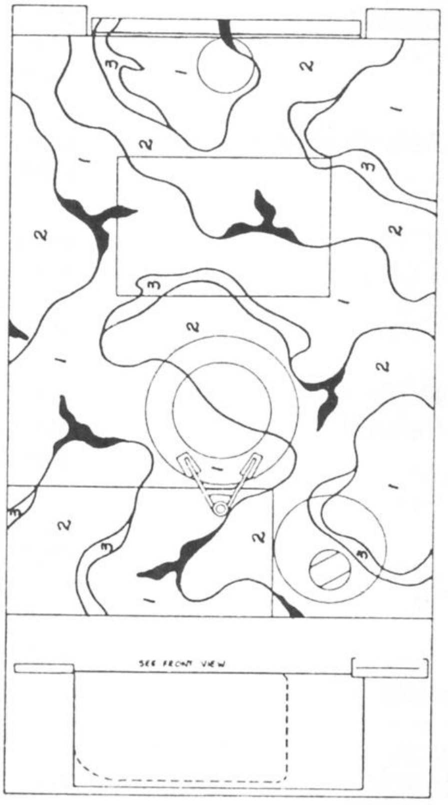
Letters and Materials furnished by the Public Information Officers at Ford Hood, MERDC and the Office of the Chief of Information.

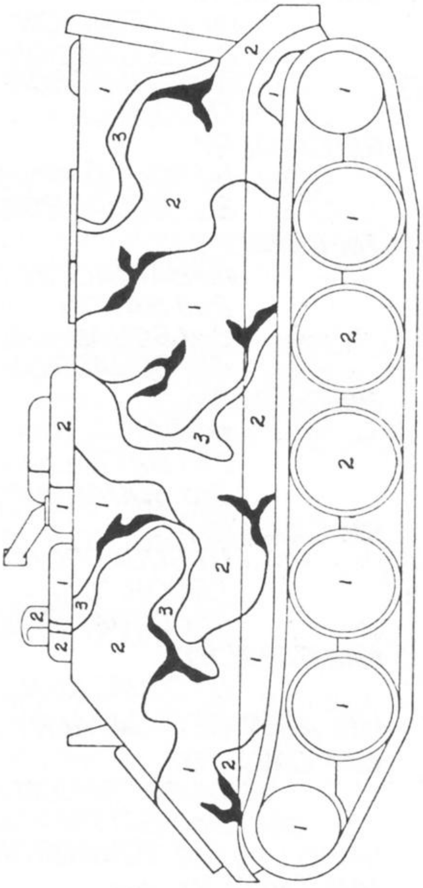
Continued on Page 40

Pattern painting design for the M113 personnel carrier.

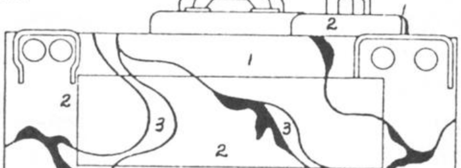








Repeat pattern on inside of surfboard, rear door, and all hatch covers.



M113 PERSONNEL CARRIER

(M125 & M106 Mortar Carriers)

U.S. ARMY ARMOR-CAVALRY UNITS

ARMOR-CAVALRY UNIT	UNIT OF ASSIGNMENT
1st CAVALRY	
1st SQUADRON	1st ARMORED DIVISION
2nd SQUADRON	2nd ARMORED DIVISION
TROOP "E" (AIR)	172nd ARCTIC LIGHT INFANTRY BDE.
7th SQUADRON	194th ARMORED BRIGADE
2nd ARMORED CAVALRY REGIMENT	Separate
3rd ARMORED CAVALRY REGIMENT	Separate
4th CAVALRY	
1st SQUADRON	1st INFANTRY DIVISION (MECH.)
2nd SQUADRON	25th INFANTRY DIVISION
TROOP "E"	205th SEP. INFANTRY BDE. (USAR)
5th CAVALRY	
1st BATTALION (MECH.)	1st CAVALRY DIVISION
2nd BATTALION (ARMOR)	1st CAVALRY DIVISION
3rd SQUADRON (AIR)	9th INFANTRY DIVISION
TROOP "D"	187th SEP. INFANTRY BDE. (USAR)
6th CAVALRY	
1st SQUADRON (PROVISIONAL) *	6th CAVALRY BDE. (AIR COMBAT)
2nd SQUADRON	194th ARMORED BRIGADE
7th CAVALRY	
1st BATTALION (ARMOR)	1st CAVALRY DIVISION
2nd BATTALION (MECH.)	1st CAVALRY DIVISION
3rd SQUADRON	3rd INFANTRY DIVISION (MECH.)
4th SQUADRON	2nd INFANTRY DIVISION
8th CAVALRY	
1st BATTALION (ARMOR)	1st CAVALRY DIVISION
2nd BATTALION (ARMOR)	1st CAVALRY DIVISION
3rd SQUADRON	8th INFANTRY DIVISION
9th CAVALRY	
1st SQUADRON	1st CAVALRY DIVISION
TROOP "C"	157th SEP. INFANTRY BDE. (USAR)
4th SQUADRON (AIR)	6th CAVALRY BDE. (AIR COMBAT)
10th CAVALRY	
1st SQUADRON	4th INFANTRY DIVISION (MECH.)
11th ARMORED CAVALRY REGIMENT	Separate
12th CAVALRY	
1st BATTALION (MECH.)	1st CAVALRY DIVISION
2nd BATTALION (MECH.)	1st CAVALRY DIVISION
3rd SQUADRON	3rd ARMORED DIVISION
14th CAVALRY * *	
15th CAVALRY	
TROOP "A"	197th INFANTRY BRIGADE
16th CAVALRY * *	
17th CAVALRY	
1st SQUADRON (AIR)	82nd AIRBORNE DIVISION
2nd SQUADRON (AIR)	101st AIRBORNE DIVISION (AIR ASLT.)
7th SQUADRON (ATK. HEL.)	6th CAVALRY BDE. (AIR COMBAT)
13th ARMOR * * *	
1st BATTALION	1st ARMORED DIVISION
32nd ARMOR	
1st BATTALION	3rd ARMORED DIVISION
2nd BATTALION	3rd ARMORED DIVISION
3rd BATTALION	3rd ARMORED DIVISION
6th BATTALION	4th INFANTRY DIVISION (MECH.)

33rd ARMOR		
	1st BATTALION	3rd ARMORED DIVISION
	2nd BATTALION	3rd ARMORED DIVISION
	3rd BATTALION	3rd ARMORED DIVISION
34th ARMOR		
	2nd BATTALION	4th INFANTRY DIVISION (MECH.)
35th ARMOR		
	1st BATTALION	1st ARMORED DIVISION
	3rd BATTALION	1st ARMORED DIVISION
37th ARMOR		
	1st BATTALION	1st ARMORED DIVISION
	2nd BATTALION	1st ARMORED DIVISION
	4th BATTALION	194th ARMORED BRIGADE
40th ARMOR		
	COMPANY "B"	III. CORPS ARTILLERY
	COMPANY "F"	BERLIN BRIGADE
	8th BATTALION	NON-DIVISIONAL USAR - ATTACHED TO 2nd ARMORED DIVISION
63rd ARMOR		
	1st BATTALION	1st INFANTRY DIVISION (MECH.)
	2nd BATTALION	1st INFANTRY DIVISION (MECH.)
	3rd BATTALION	1st INFANTRY DIVISION (MECH.)(FWD.)
	4th BATTALION	1st INFANTRY DIVISION (MECH.)
64th ARMOR		
	1st BATTALION	3rd INFANTRY DIVISION (MECH.)
	2nd BATTALION	3rd INFANTRY DIVISION (MECH.)
	3rd BATTALION	3rd INFANTRY DIVISION (MECH.)
	4th BATTALION	3rd INFANTRY DIVISION (MECH.)
66th ARMOR		
	1st BATTALION	2nd ARMORED DIVISION
	2nd BATTALION	2nd ARMORED DIVISION
67th ARMOR		
	1st BATTALION	2nd ARMORED DIVISION
	2nd BATTALION	2nd ARMORED DIVISION
68th ARMOR		
	1st BATTALION	8th INFANTRY DIVISION (MECH.)
	2nd BATTALION	8th INFANTRY DIVISION (MECH.)
	3rd BATTALION	8th INFANTRY DIVISION (MECH.)
	4th BATTALION (LIGHT)(AIRBORNE)	82nd AIRBORNE DIVISION
	5th BATTALION	8th INFANTRY DIVISION (MECH.)
	6th BATTALION	157th SEP. INFANTRY BDE. (USAR)
69th ARMOR		
	2nd BATTALION	197th INFANTRY BRIGADE
	4th BATTALION	8th INFANTRY DIVISION (MECH.)
70th ARMOR		
	1st BATTALION	4th INFANTRY DIVISION (MECH.)
72nd ARMOR		
	1st BATTALION	2nd INFANTRY DIVISION
73rd ARMOR		
	1st BATTALION	2nd INFANTRY DIVISION
	4th BATTALION	1st INFANTRY DIVISION (MECH.)(FWD.)
77th ARMOR		
	1st BATTALION	4th INFANTRY DIVISION (MECH.)
	2nd BATTALION	9th INFANTRY DIVISION
81st ARMOR		
	2nd BATTALION	1st ARMORED DIVISION

Notes Appear on Page 40

NEW ARMOR MODELS

On May 23rd of this year, a Plastic Hobby Show was held at Shizuoka, Japan. At this show, Japanese model manufacturers displayed the models that you will be buying this year. It is our intent to illustrate a number of these new kits which you may not have seen. It is clear that the modeling state-of-the-art has again been raised, and it appears that makers have been watching and taking note of what modelers are looking for. The pictures appearing in this article were taken by our Japanese correspondent, Dr. Koyu-Go, and they show models on display at the show.

The pictures above show a number of new Tamiya releases in 1:35th scale. From top to bottom, they include a German *Marder II.* self-propelled anti-tank gun, a German *Sd. Kfz. 223* light signal armored car, and an American M-577 Armored Command Post vehicle. Also new from this company are models of a Russian KV-II heavy tank and a German *Horch Typ 1a Kfz. 15* heavy car.

Nichimo has released a model of the German *Königstiger* (or Tiger II) heavy tank which includes Porsche and Henschel turrets. This kit is in direct competition to Tamiya's earlier Tiger II., but we understand that Tamiya is in the process of re-releasing their Tiger II., which has been revised and provided with a new crew.

Continued on Page 41

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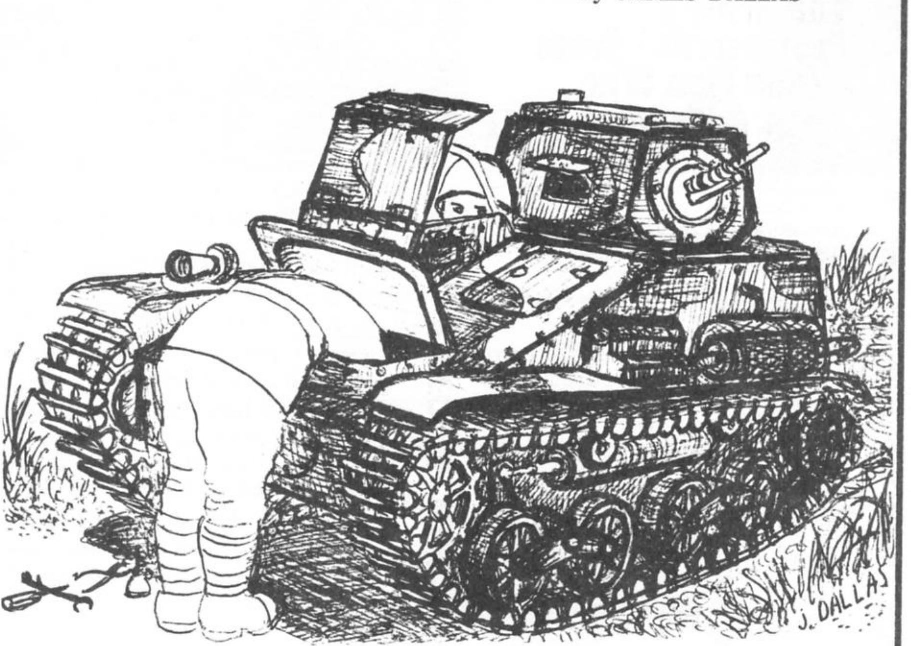

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